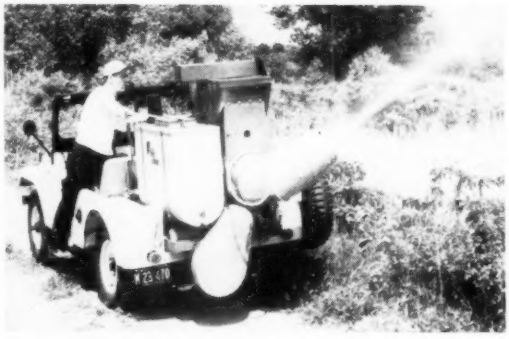
PEST CONTROL

APRIL 1959

Three U. S. Department of Agriculture laboratories report on 1958 activities

Latest in Search for Better Mosquito Controls . . . Pg. 9



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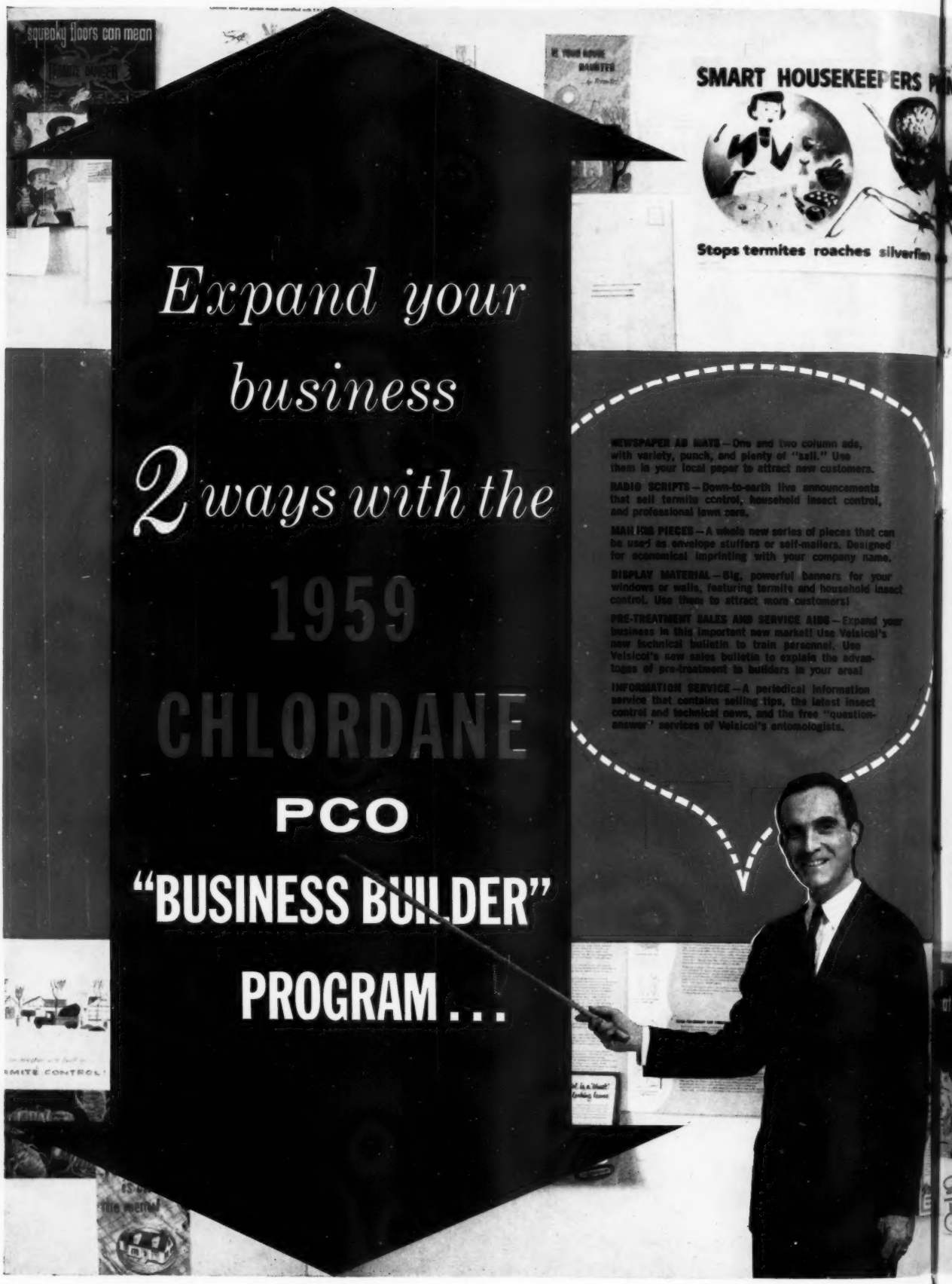
Monthly Magazine of Methods, Chemicals and Equipment for Urban and Industrial Pest Control and Sanitation Since 1933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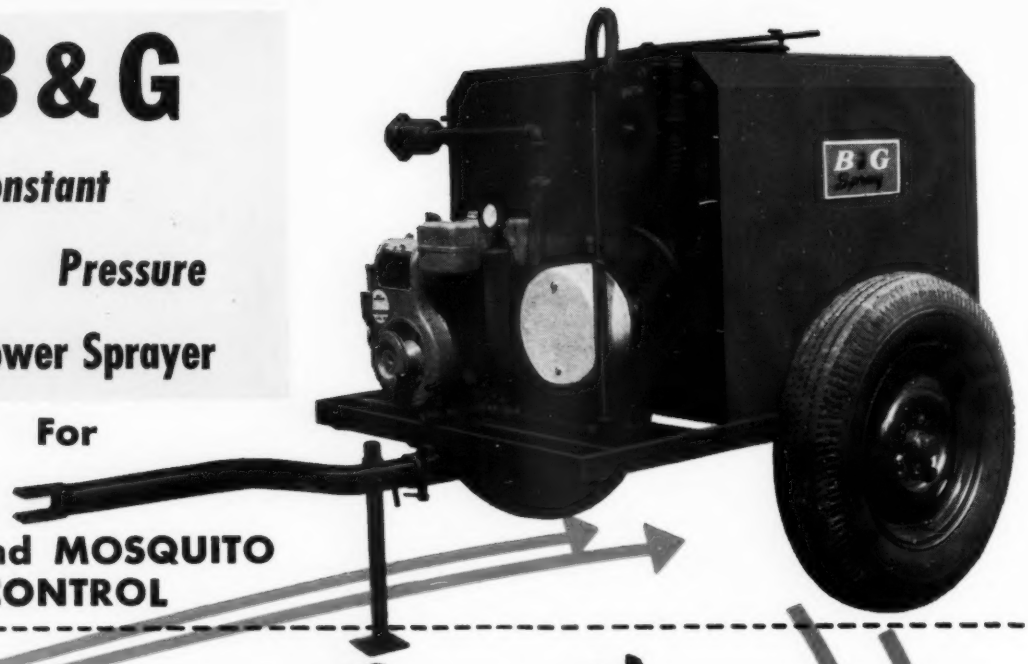

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PEST CONTROL

APRIL 1959

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$100 Million Plus

This month in Salt Lake City's Hotel Utah, some 350 are attending the annual meeting of the American Mosquito Control Association. The members of this group direct mosquito control programs involving total expenditures of more than $100 million every year, a figure that might be doubled, for the latest estimate is nearly ten years old.

As Indiana-assigned CDC counselor, Dr. Maxwell J. Wilcomb, told pest control operators at Purdue in January, mosquito abatement programs do not operate in competition with PCOs, but rather work in harmony with them. Mosquito abatement districts are area-wide, they overlap private boundaries, are publicly-financed, and thus cannot engage in "spot" treatments for individual property owners. Individualized control can best be by professional pest control companies.

Every PCO knows his efforts cannot be successful if he must combat insect or rodent "invasions" from property beyond the boundaries of his customer. Thus, area mosquito control relieves this outside pressure and "localized" control measures can be more effective.

A small group of devoted state and federal experts runs the activities of the 1200-member AMCA on a budget of less than $12,000 annually. Yet its program has helped develop effective mosquito control measures around the world.

There are some who feel mosquito control officials compete with pest control operators, and vice versa. But both are operating members of the overall urban/industrial pest control field, and some greater measure of cooperation and understanding between them should prevail.

Letters

Orkin-Nolen "Secrecy" Decision Brings Davis Comment

I have read with interest and concern your February editorial and agree whole-heartedly with your observations regarding Judge Cannon's decision. Certainly a judge should know more than law in making such a blanket decision. Why doesn't the court call in expert advice in such cases? A question that intrigues me is what is a "unique and irreplaceable" operator. It sounds like a joke. Also, it is confusing to have secrecy brought up as an issue.

To be sure, some 25 years ago, companies claimed secret formulas, but since the development of regional conferences, and research and publicity by state, Federal, and industry organizations, we no longer think of individual firms possessing secret formulas. Nowadays we think of efficient pest control as dependent largely upon correction and thorough application of the right method or chemical. We know the chemicals and it is up to the operator to have the right training and ethics to perform the job.

J. J. Davis

Professor Emeritus
Department of Entomology
Purdue University
Lafayette, Ind.

Warns Against 5% DDT For Fabric Pests

In *Pest Control*, Jan. '59, "How to Control Silverfish, Clothes Moths, Carpet Beetles" I refer you to page 33 under "Control." Anyone without experience could find himself with a damage claim because of the blooming action of the 5% DDT.

A few years ago, our insurance company settled a claim we had for about $600. All dark surfaces bloomed and continued to bloom.

John Blasko

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When we shake the hand of a competitor in the spirit of friendship and not merely as a social formality, then our business will have become a profession.

Byron Kaufmann

Theodore Meyer Estate
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Pest Control welcomes expressions of opinions from its readers. Send ideas and comments as briefly as possible to James A. Nelson, Editor, Pest Control, 1900 Euclid Avenue, Cleveland 15, Ohio.

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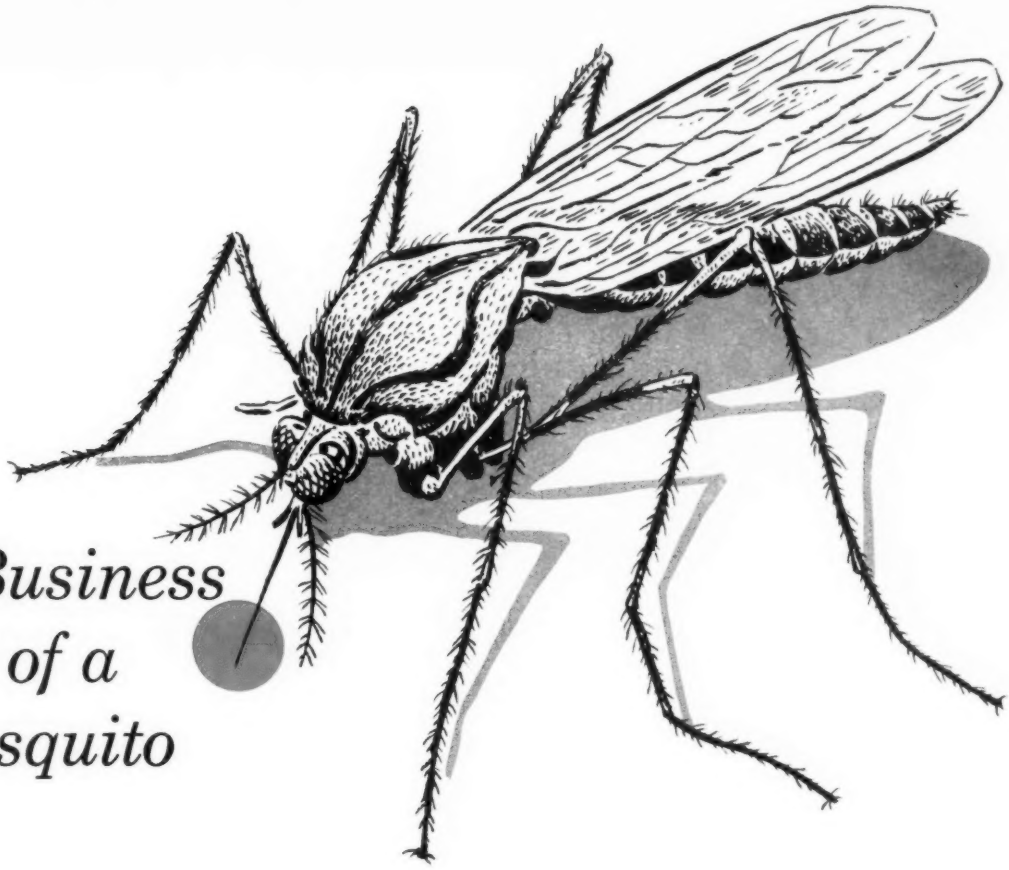

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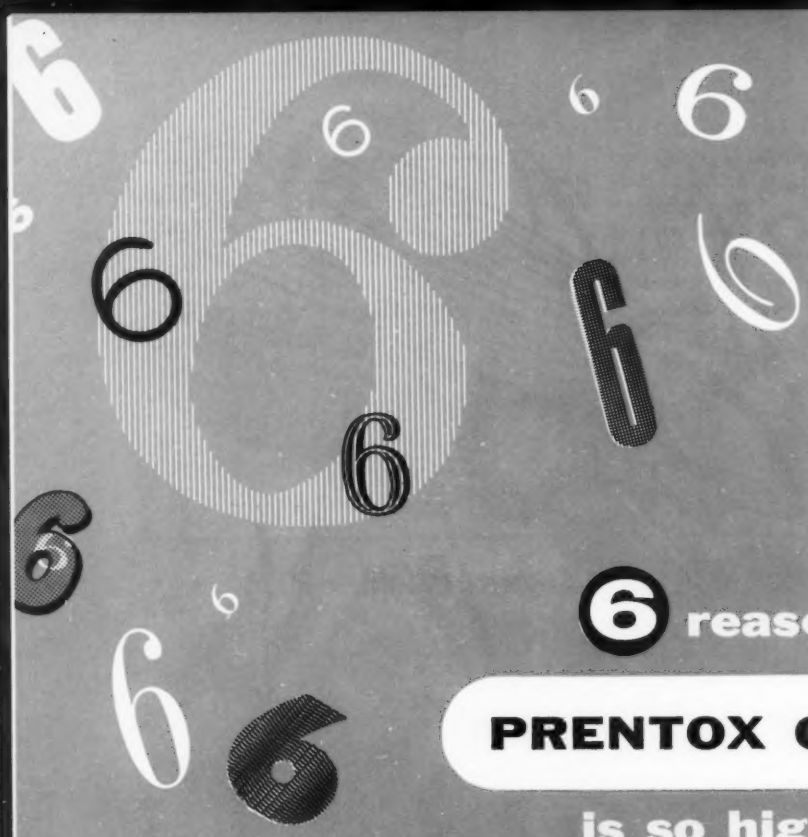

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USDA Mosquito Control Research for 1958

by

W. C. McDUFFIE
J. B. GAHAN
A. N. DAVIS
L. F. LEWIS

Entomology Research Division
Agricultural Research Service
U. S. Department of Agriculture

DURING 1958 the Insects Affecting Man and Animals Research Branch of the Entomology Research Division continued its efforts to develop more effective insecticides and methods of application for controlling mosquitoes. As in previous years, the greatest emphasis was placed on the search for substitutes for materials to which some species had become resistant. The most important work involved the evaluation of materials as possible substitutes for DDT and dieldrin in the treatment of homes for malaria control. Another project was the evaluation of dusts for control of adults. A major addition to the program was the establishment of a laboratory at Reno, Nev., to study the relation of soil and water management to the mosquito problem in irrigated areas in cooperation with the Soil and Water Conservation Research Division. The purpose of this paper is to review the progress on these projects as well as those of a continuing nature.

Screening of Larvicides

At the Orlando, Fla., laboratory approximately 1,000 new compounds were screened for toxicity to larvae of *Anopheles quadrimaculatus*. A large number of them were effective at a concentration of 1 p.p.m., but only eight were highly toxic at 0.05 p.p.m. or less. These materials will be evaluated in the field next season if sufficient quantities are provided by their manufacturers. Their chemical names are not available for release at the present time.

At the Corvallis, Oreg., laboratory larvicide screening was limited largely to materials that had shown a high toxicity in screening tests at Orlando. Most of them were tested against both normal and malathion - DDT - resistant strains of *Culex tarsalis*. In 1958 about 50 organic - phosphorus compounds and chrysanthemumic acid esters were evaluated. The most toxic materials were EPN and parathion, both of which were effective at 0.003 p.p.m. against both strains of *tarsalis*. Two confidential compounds gave over 90 percent kill at 0.01 p.p.m., and several of the chrysanthemumic acid esters gave 90-100 percent kill at 0.05 p.p.m. Materials effective at 0.1 p.p.m. included such well-known insecticides as Phosdrin, dicapthon, ronnel (Dow ET-57), Delnav (Hercules AC - 528), Co - Ral (Bayer 21/199), para-oxon, and several confidential compounds. By way of comparison, malathion gave 100 percent kill of susceptible larvae at 0.1 p.p.m., whereas 10 p.p.m. were required for complete kills of the resistant strain.

Screening of Adulticides

During the past year the Orlando laboratory has undertaken a program of screening new compounds as adulticides. This was made possible by the development of a laboratory colony of DDT-resistant *Aedes taeniorhynchus* (Davis 1958). Test materials were selected on the basis of their toxicity as larvicides and evaluated as sprays in a modified wind-tunnel device (Roan and Kearns 1948). Malathion, which gives 90-100 percent kill of adults at a concentration of 0.05 percent, was used as a standard. None of the materials tested thus far have proved equal to malathion, but a small number have been highly effective at 0.25-0.1 percent. However, a good backlog of promising larvicides is available for testing, and some of these may prove to be good adulticides.

Field Tests of Larvicides

Small-plot tests were conducted in Florida with granular formulations of nine insecticides against late fourth-instar larvae of *Aedes taeniorhynchus* and *A. sollicitans*. All the materials had shown promise in previous tests but had not been tried in granular form. Parathion was the most effective, giving 100 percent kill at 0.05 pound per acre. Complete to nearly complete control was obtained with Bayer 29493 at 0.2 and Diazinon and barthrin at 0.25 pound per acre. Bayer 22408 gave 67 percent kill at 0.2 pound per acre but was not tested at higher dosages. Sevin, ronnel, dicapthon, and 2,4 - dimethylbenzyl chrysanthemumate were almost completely ineffective at 0.25 and 0.5 pound per acre.

Field studies in Oregon were concerned chiefly with larvae that breed prolifically in log ponds. The principal species are *Culex peus*, *C. pipiens*, *C. tarsalis*, *C. territans* and *Culiseta incidens*. Since the treatment of log ponds is difficult and expensive, most of the tests were with fairly high dosages in an effort to obtain prolonged control but avoid the hazards in using certain materials. One pound of heptachlor or Co-Ral provided complete initial control, but retreatments were required at 3-week intervals. Guthion at 0.25 pound per acre

Presented at the 46th Annual Meeting of the New Jersey Mosquito Extermination Assn., March 18-20, 1959.

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gave 100-percent immediate control but no residual effect. Parathion at 0.25 and Dylox at 0.63 pound per acre were less effective.

Field Tests of Adulticides

There has always been considerable difference of opinion as to the effectiveness of sprays and fogs for control of adult mosquitoes. During the last several years a few workers have reported better results with dusts. In 1958, therefore, at the Orlando laboratory a series of tests was conducted to compare dusts, sprays, and fogs of malathion against adult salt-marsh mosquitoes. The dust contained 5 percent of malathion and was applied at 40 and 80 pounds per mile. The fogs and sprays were 5- and 10-percent oil solutions applied at 9 gallons per mile. Dusts and sprays were applied with a Buffalo Turbine and fogs with a special thermal aerosol unit developed by the Brevard County, Florida, Mosquito Control District.

The results obtained in these tests were variable, but all types of applications gave excellent results in some tests. Dusts and fogs were very effective when the wind velocity was less than 1 m.p.h., and there was no difference in the two rates of application. Neither rate was highly effective when applied in winds of 5 m.p.h. On the other hand, the sprays gave excellent control when applied in a 5 m.p.h. wind and poor results in winds of less than 1 m.p.h.

Several tests were conducted to evaluate a thermal aerosol unit developed by the Brevard County Mosquito Control District and mounted on a Stearman plane. Good control of salt-marsh mosquitoes was obtained with a 12-percent malathion solution applied in 100-foot swaths at the rate of 100 gallons per hour. Further tests are needed to determine the limitations of this equipment, but the initial results indicate that it has promise of being an economical means of adult mosquito control.

For several years the Corvallis, Oreg., laboratory has cooperated with the Bureau of Vector Control of the California State Department of Health and the San Joaquin Mosquito Abatement District in evaluating malathion fogs against adult mosquitoes (Gjullin and Lewallen 1958). The tests have been centered on small towns in order to obtain results against *Culex tarsalis* adults, which congregate in buildings and other sheltered places in the daytime, as well as *Aedes* species, which stay in the open. Treatments were made with a Tifa fog machine during the early daylight hours when winds ranged from 2 to 5 miles per hour. The fog applications provided satisfactory control of outdoor species but were less effective against *tarsalis*. Counts in buildings indicated about 50 percent control of adults, but light-trap collections were slightly higher than before the treatments. The poor results obtained in these tests point up the need for further research on methods and materials for controlling species that rest in protected places during the day.

Building Treatments For Control of Adults

For the last twelve years the most effective weapon in the worldwide war against malaria has been the residual spraying of the interior of buildings with DDT and dieldrin. However, repeated use of these insecticides has resulted in the development of resistance in *Anopheles* vectors in certain areas, and substitute insecticides are urgently needed to continue the fight against malaria. Several years ago the Orlando laboratory initiated a program of screening residual insecticides which produced a small number worthy of field evaluation (LaBrecque *et al.* 1958). In 1958 six of these materials along with DDT were tested extensively in Arkansas in buildings where large numbers of *quadrimaculatus* adults habitually rested during the day (Gahan and Hoffman 1959).

Malathion was the most effective insecticide tested. Applications of 200 mg. per square foot were still at least 98 percent ef-

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fective after 11 weeks. Similar applications of Diazinon and DDT failed in 5 to 7 weeks in some tests but continued to be effective for 8 to 11 weeks in others. Dicapthon gave satisfactory control for 5 weeks and ronnel for 3 to 5 weeks. Barthrin and 2,4-dimethylbenzyl chrysanthemumate were highly effective for 2 weeks at 200 mg. per square foot, and twice this dosage gave good control for 3 to 5 weeks. The results with the last two compounds were disappointing, but those with malathion suggest that it would be an excellent substitute for DDT in malaria control programs.

Outdoor Residual Treatments For Adult Control

Several years ago studies in Florida showed that residual applications of 2 pounds of DDT per acre to low vegetation and ground litter would provide excellent protection against daylight annoyance from salt-marsh mosquitoes for several weeks. In Oregon similar treatments around camp sites provided excellent protection against mountain species for 3 to 4 weeks. Additional studies in Florida showed that lindane was more effective than DDT, dieldrin, or chlordane (Orlando, Fla., Laboratory 1955). However, as resistance increased the periods of effectiveness of all these insecticides declined markedly.

Further studies on 2-acre plots in Florida in 1958 showed that 2 pounds per acre of malathion, barthrin, and 2,4-dimethylbenzyl chrysanthemumate gave a high degree of protection for 2 days but little or none after 6 days. Heavy rains 2 days after the treatments were made undoubtedly contributed to the quick decline.

Mosquito Problems in Western Irrigated Areas

Mosquitoes are a serious problem in the extensive irrigated areas in the Western States. They breed prolifically in pastures, fields, seepage areas, impoundments, and other water sources. Their attacks cost livestock and poultry growers millions of dollars annually in reduced weight gains, milk production, and work efficiency. In addition, they create a public-health problem. Many areas have mosquito-control organizations to cope with the problem, but conventional methods frequently are inadequate or uneconomical. The most practical and effective solution, therefore, lies in the elimination of mosquito breeding through proper management and efficient use of water and land. In 1958 studies with this in mind were initiated in western Nevada in cooperation with the Soil and Water Conservation Research Division.

The first season's studies in Nevada were concerned largely with determining the species present in irrigated areas, their relative abundance and importance, seasonal trends, preferred breeding habitats, factors affecting breeding and overwintering habits. A great deal of informa-

Nobody likes the mosquito. It's banned in Boston . . . barred from Buffalo . . . kicked out of Kokomo. It's being routed from resorts . . . inched out of industry . . . condemned by cities.

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tion has been collected which will serve as a basis for further studies.

Observations thus far have shown *Aedes nigromaculis* to be the most important species during the summer months, followed by *A. dorsalis*, *A. melanimon*, and *Culex tarsalis*. *A. nigromaculis* occurred almost exclusively in irrigated fields, whereas *dorsalis* and *melanimon* bred extensively in seepage areas as well as in fields. The latter species was seldom found in even slightly alkaline waters, whereas *dorsalis* bred prolifically in highly alkaline as well as fresh water. *C. tarsalis* appeared to breed to some degree in all types of waters.

With the advent of cool weather breeding by *Aedes* species gradually declined to insignificance, despite heavy fall irrigation to provide a maximum of soil moisture for the winter months. However, this practice brought about an increase in breeding of *tarsalis*, *incidens*, and especially *Culiseta inornata*.

Studies thus far suggest that breeding by certain species can be minimized by appropriate land and water management. For example, more efficient use of water should take care of *nigromaculis* breeding in irrigated fields. Seepage areas that produce *dorsalis* and *melanimon* are a more difficult but not insurmountable problem. More complete information on the biology of these species and research on the nature of the soils, drainage, and better ditch construction should lead to a practical solution to such problem areas.

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Abatement Districts Cooperate With PCOs in Mosquito Work

by **DR. MAXWELL J. WILCOMB, JR.**
Technical Supervisor
Hammond Vector Control Demonstration, Hammond Health Department
Hammond, Indiana

Contrary to what some pest control operators think, there is no basic conflict of interests between PCOs and officials of mosquito abatement districts. Instead, the two complement each other in their control activities.

Mosquitoes can cross jurisdictional boundaries, but city- or county-sponsored control operations cannot. That's why tax-supported mosquito abatement districts are established to cover principal breeding sites which may overlap several population areas. But as a tax-financed agency, such a district must provide equal service to all taxpayers, so requests from individuals for special service cannot be handled. This is where the PCO comes in.

District's Job; PCO's Job

Through the work of the abatement district, the public is made aware of mosquitoes and their importance, and simultaneously realizes the value of a contract with PCOs to complete control on individual premises. A successfully organized abatement district must rely heavily upon public cooperation to achieve control.

The work of the district is routine source reduction, larviciding, and, less commonly, adulticiding within the district's boundaries. Although these measures generally provide the most effective mosquito reduction for the tax dollar, source reduction and larviciding are rarely 100% effective.

These are not activities ordinarily conducted by pest control operators, but the PCO does perform mosquito adulticiding by contract in neighborhoods and on an individual basis for drive-ins or for special outdoor affairs and lawn parties. This is work which cannot be done by an abatement district, yet it is often necessary if area-wide control is to be effective.

Requests for other "bonus" services, such as control of box elder bugs, hornets, pigeons, mites or thrips in yards, etc., likewise may be referred to the PCO by mosquito abatement personnel. Such district headaches which are not their responsibility become the PCO's profit.

Districts also may purchase some supplies and equipment through PCOs who are authorized dealers. And in some sections of the country, districts have even contracted some of their control work to PCOs, but this is not a common practice.

How should a PCO find out if there is a mosquito district in his area? Since most districts prepare a good many public information articles, the operator should watch his hometown newspaper for stories on local district activities; also to get names of contacts.

Otherwise, the PCO will have to track down district officials through other sources. The department of state government responsible for vector control differs in states, so there's no one single agency the PCO can usually turn to for information without some looking. It may be the health, agriculture, or conservation department, a special board, a state university or college, or even several different agencies.

States with Mosquito Districts

At least 24 states now have mosquito abatement districts: Alabama, Arkansas, California, Connecticut, Delaware, Florida, Illinois, Maine, Massachusetts, Minnesota, Mississippi, Montana, Nevada, New Jersey, New York, North Carolina, Ohio, Oregon, Pennsylvania, Rhode Island, Texas, Utah, Vermont, and Virginia.

The necessity for close cooperation between PCOs and mosquito abatement districts is essential. Experience supports this contention. Seventeen districts in Illinois, 47 in California, 12 in Utah, 16 in New Jersey, 20 in Florida, a total nationally of more than 150—all enjoy harmonious working relationships with the PCO.

Presented at the 1959 Purdue University PCO Conference, January 26-30.

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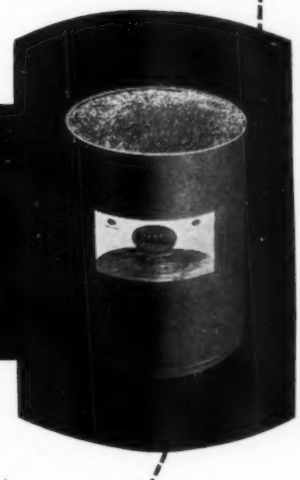

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How Far Do Flies Fly?[1]

and what effect does flight pattern have on their control?

by **DR. HERBERT F. SCHOOF**
Chief, Biology Section, Communicable Disease Center, Savannah, Georgia

Fig. 1 — Introducing radioactive milk-honey solution into fly cage.

HOW FAR does a fly fly? Like many other queries on insect biology, the question is one to which a direct answer is expected. A reply of 1, 5, or 10 miles finds the questioner well satisfied. Unfortunately, in discussing this (or almost any other) aspect of fly biology, an unqualified answer usually is misleading or false since no consideration is given to the differences in response which exist among various species or which may occur in an individual species under varying seasonal or climatic conditions.

In this article, discussion shall be limited chiefly to the house fly *Musca domestica* and to the blow flies of the genera *Phormia*, *Phaenicia*, and *Callitroga*. These flies are the ones generally found most frequently within communities and in homes throughout the country. Other species, such as the stable fly, lesser house fly, and fruit flies, may be of importance in certain areas but, except for limited studies on *Drosophila*, information on their dispersal is meager.

The dispersal characteristics of flies have been one of man's concerns ever since workers realized the role such insects could play in the transmission of disease. Early workers ((Zetek (1914), Hindle and Merriman (1914), Parker (1916), and Bishopp and Laake (1921)) uncovered much information on the dispersal habits of domestic flies, using specimens marked by means of powdered chalk, paint pigments, or dyes. Unfortunately, detection of specimens tagged by these methods was relatively time consuming and tedious. Little further work in the field was done from 1921 until the advent of radioisotopes. The latter provided a positive means of marking flies which subsequently could be readily detected in trap catches. The availability of this new tool led to a renewed interest in fly dispersal, studies being conducted by investigators in Arizona, Oregon, West Virginia, and Georgia.

"Fed" Radioactive Tags

In these recent tests, the general procedures have consisted of tagging the flies with P-32 by feeding the adult specimens with milk-honey or sugar solutions (1 millicurie of P-32 per liter of milk) for a 24-hour period (Fig. 1). In most instances, wild-caught flies were employed; when such were scarce, use was made of laboratory - reared specimens. After release, the marked flies were recovered by baited traps distributed at various distance intervals from the liberation site. In several studies ((Quarterman *et al.* (1954a,b), Schoof and Mail (1953), Schoof and Siverly (1954b)) flies were liberated simultaneously from two or more sites, the radioactive specimens from each site being dusted with a different dye. Detection of the radioactive flies was by means of a laboratory or field monitor equipped with a thin-walled Geiger tube. Specimens secondarily marked by dye were identified by pipetting a drop of acetone on the specimen placed on filter paper or toweling. The acetone dissolved the dye, the color of which was readily discernible on the white paper background.

The flight habits of the different species of flies can be evaluated from several aspects: speed of movement, maximum dispersal, and the movement of the mass population.

Travel Time

With reference to speed of dispersal, studies by several investigators indicate that *M. domestica* can move to distances of 4.0 to 6.3 miles within 24 hours (Table 1). These records reflect dispersal of a limited number of specimens. Data more representative of the movement of the house fly population as a whole are shown in Figure 2 which indicates the cumulative percentage of stations positive for radioactive house flies at the 4.8 to 5.9 mile interval over a 120-hour period.

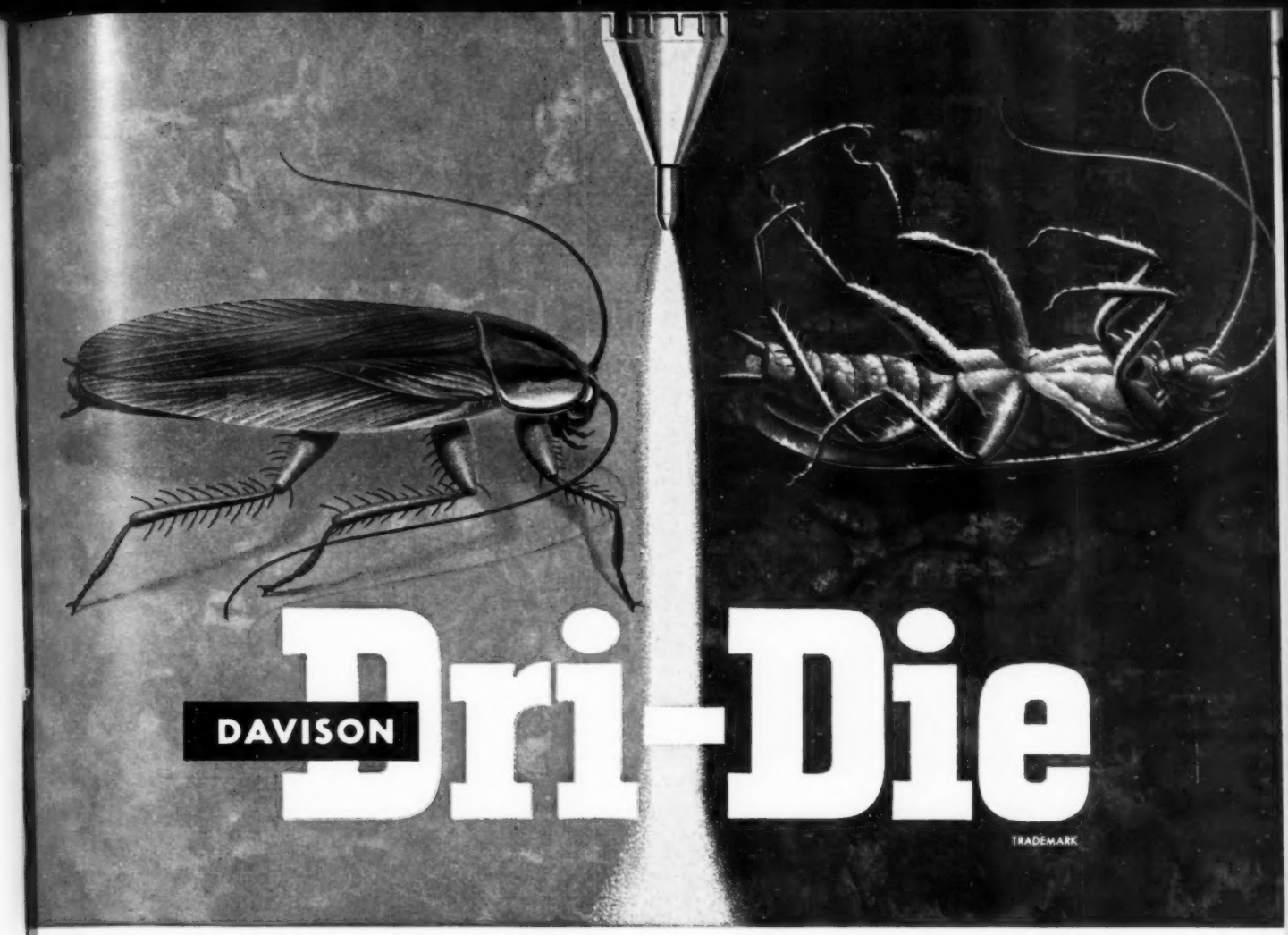
Speed of movement data for other species are shown in Table 2. Based on 48-hour recoveries, *Phormia regina* apparently dis-

TABLE ONE

Maximum Speed of Dispersal of Musca domestica Based on Recaptures within 24 Hours after Release.

Reference No.	State (area)	Distance (miles)
(1)	Texas (rural)	6.3
(5)	Georgia (urban)	5.2
(6)	Georgia (rural)	5.0
(3)	Oregon (rural)	4.0
(10)	Arizona (urban)	5.0

1. From the Communicable Disease Center, Bureau of State Services, Public Health Service, U. S. Department of Health, Education, and Welfare, Savannah, Georgia.



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perses more rapidly than all species of flies studied. Within a 24-hour period, *Musca domestica* moves to distances comparable to those traveled by the common blow fly species; but during the second 24-hour interval it showed only a slight increase in the distance traveled (i.e., from 5.2 to 7.6 miles, Quarterman *et al.* 1954a; from 5.0 to 5.6 miles, Schoof and Siverly, 1954b).

Distances for Individuals and Mass Populations

When maximum distance traveled is the criterion used, it is evident that individual specimens are capable of considerable flight. *M. domestica* has been captured at distances of 7.3 to 20.0 miles from release sites (Table 3), whereas recoveries of certain species of blow flies are recorded from 15 to 28 miles (Fig. 3). *Phormia regina* apparently roams over considerable area since recoveries beyond 10 miles do not represent isolated captures alone. Comparative dispersal data on *P. regina* and *M. domestica* for the same test (Table 4) indicate the greater range of the former species. Only 3% of the house flies recovered were captured at or beyond 4.0 miles whereas 13% of *P. regina* were trapped between 4 and 28 miles, more than 8% being retrieved at or beyond 11 miles.

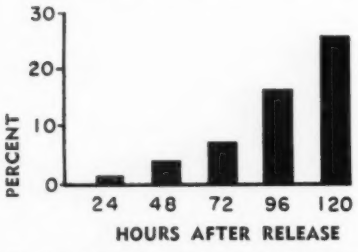


Fig. 2 — Speed of movement of **M. domestica** based on cumulative percentages of positive stations at distance of 4.8 to 5.9 miles and 24 to 120 hour period (107 traps used).

In relation to the effect upon man, the dispersal of the mass of the fly population rather than that of a few individuals is the significant criterion. Thus, annoyance and disease transmission by flies in communities and, therefore, control efforts, are governed largely by the movement and habits of the population mass. Unfortunately, in many cases undue stress is placed on the fact that one or two specimens are recaptured 15 to 20 miles from the release site. Thus, the generalization is made that the flight range of the species is of that magnitude. However, from the control standpoint, the wanderings of a few individuals are of minor significance compared to the movement of the bulk of the population. This point always must be kept in mind when considering any type of dispersal data.

Cumulative percentage recoveries of *M. domestica* within 1 mile, range from 55 to 96; within 2 miles, from 77 to 100 (Table 5). However, in considering the data for most of these tests, the fact that a greater number of traps usually was operated in the 1.0 mile zone than in the outlying intervals must be taken into account. Moreover, even with an equal number of the traps per distance interval, the area served by each trap in the outer intervals would have been far greater than that of the intervals closer to the release site. A certain degree of adjustment can be obtained by analyzing the data on the basis of the average number of flies per trap in each distance zone. However, in multiple release studies at Phoenix, Arizona, the percentage recoveries of tagged house flies (based on the average number of specimens per trap) in the 0.2-1.1 mile zone and in the 1.2 to 2.3 mile zone were found to be similar, even though the ratios of the number of traps for these two zones varied from 1:3 to 1:1 and 2:1. In one study where the maximum distance trapped was 1.0 mile and the number of trap sites per unit area for the first and second half mile zones was approximately equal, the percentages of flies recovered in the 0.1

TABLE TWO

Maximum Speed of Dispersal of Blow Flies and Other Species.

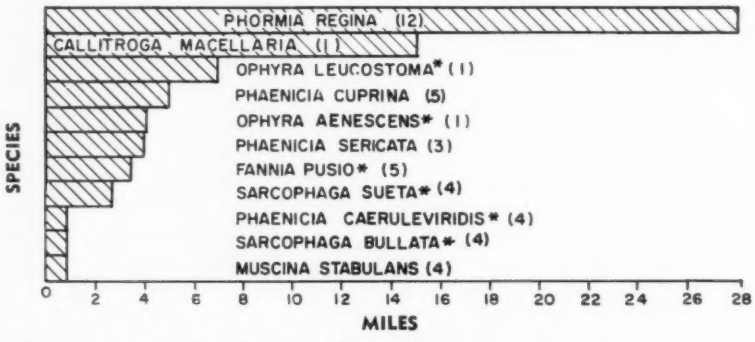
Species	Reference No.	State (area)	Distance (Miles) 24 Hrs.	48 Hrs.
Phormia regina	(12)	Oregon (rural)	—	16.5
" "	(1)	Texas (rural)	3.0	11.0
Callitroga macellaria	(1)	" "	8.0	10.0
" "	(5)	Georgia (urban)	2.8	7.2
Phaenicia sericata	(5)	" "	—	3.5
Phaenicia cuprina	(5)	" "	—	5.0
Sarcophaga bullata	(5)	" "	1.8	—

TABLE THREE

Maximum dispersal distance of Musca domestica

Reference No.	State (area)	Distance (miles)
(1)	Texas (rural)	13.1
(5)	Georgia (urban)	7.6
(6)	Georgia (rural)	8.3*
(10)	Arizona (urban)	7.3*
(12)	Oregon (rural)	20.0

* Limit of trapping area.



***Represented only a small percentage of the total flies released in these tests.**

Fig. 3 — Maximum dispersal of blow flies and other species. (3) = Reference number.

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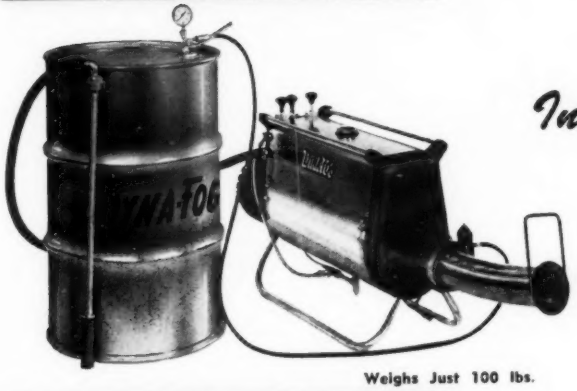

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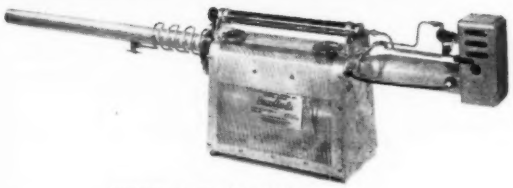

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to 0.5 mile zone was 52 compared to 48 in the 0.6 to 1.0 mile zone.

When the criterion used is the percentage of positive stations or positive collections per distance zone, there is similar decline in recovery rates with the increase in distance. (*e.g.*, in an experiment in which 342,000 house flies were released, the percentages of positive stations at distance intervals of 0.1 - 1.1, 1.2 - 2.3, 2.4 - 3.5, 3.6 - 4.7, 4.8 - 5.9, and 6.0 - 7.1 miles[2] were 96, 92, 48, 37, 27, and 10, respectively).

Movement of certain blow flies is more extensive than that of *M. domestica* as is depicted by the data from tests in which the trapping patterns for both house flies and species of blow flies were similar (Table 6). *Phormia regina* apparently disperses more widely than *Callitroga macellaria*. Although, in one instance, the latter species showed a dispersal pattern similar to *M. domestica*, in general it is considered to roam over a greater area than the house fly.

Secondary Stop-Offs

Fly movement as presented by the preceding data represents the dispersal of the specimens from one point to another. Where flies are recovered at maximum distances within 24 hours, it can be presumed that such flight was relatively direct. However, with the specimens subsequently recaptured, information is lacking in regard to their secondary movement between the release point and the site of capture. Some inkling as to the mode of dispersal involved was obtained from a study wherein radioactive specimens (*M. domestica* and *P. sericata*) released at one point were recaptured at three separate sites and then marked with differentiating dyes, released, and captured for the second time. The results of this experiment (Schoof and Siverly, 1954a) clearly demonstrated that fly movement is relatively haphazard, the dispersal of the specimens from each release site being of a random pattern. Consequently, some flies returned to the same site from which they had departed several days previously.

What Stimulates Fly Movement

From the studies made of fly dispersion, it is apparent that different species have the ability to move to relatively great distances at rapid rates. What are the motivating factors behind such dispersal? Parker (1916) aptly described the house fly as a migrating insect, the movement of which is partly instinct and partly due to its response to stimuli from breeding and feeding sites. These traits together with the influence of population pressure and geographic barriers make up the composite force which governs fly movement. Although a surplus of flies in rela-

TABLE FOUR

Comparative Recoveries of Phormia regina and Musca domestica at Specific Distances from 4 to 28 miles.*

Species	No. Specimens Recovered at					
	Total	Miles				
		4	8	10-15	15-20	20-28
P. regina	1606	45	11	95	52	4
M. domestica	1502	42	4	1	1	0

* Based on data from Yates, et al. (1952)

TABLE FIVE

Cumulative percent recovery of marked house flies.

Reference No.	State (area)	Cumulative Percent Recovery		
		Miles		
		1.0	2.0	3.0
(1)	Texas (rural)	91	94	99
(3)	Oregon (rural)	94	97	98
(12)	" "	89	93	97
(5)	Georgia (urban)	96	100	—
(5)	" "	66	77	85
(4)	" (rural)	55	84	92
(7)	Arizona (urban)	88	98	100[a]
(7)	" "	82	95	98
(10)	" "	68	86	93

a. Maximum distances at which traps were set.

TABLE SIX

Comparative dispersion of M. domestica versus C. macellaria and P. regina within the same trapping pattern.

Ref. No.	Species (No. specimens)	Percent of Tagged Flies Recovered Distance Intervals (miles)				
		0.1-1.0	1.1-3.0	3.1-5.0	5.1-7.0	>7.1
(6)	**M. domestica** (317)	54.8	36.8	6.3	1.5	0.6
	C. macellaria (91)	33.2	50.4	13.1	2.0	—
(5)	**M. domestica** (27)	96.0	4.0	0	—	—
	C. macellaria (56)	17.8	80.3	1.9	—	—
(5)	**M. domestica** (96)	65.4	19.8	9.4	4.1	1.2
	C. macellaria (274)	40.5	48.1	9.8	0.5	1.1
(12)	**M. domestica** (1496)	88.9	6.2	3.7	—	0.6
	P. regina (1506)	34.5	28.7	26.6	—	10.1

2. At these distances, respectively, the number of traps was 71, 75, 121, 148, 107, and 56.

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tion to feeding and breeding sites (or population pressure) may accelerate dispersal to other areas, an abundance of attractive sites for a minimum population does not necessarily prevent an exodus of specimens from that area. In many instances, flies disperse from a location despite an apparent excess of feeding and breeding opportunities therein.

Whether flies move with or against the prevailing wind currents is not obvious from these tests with radioactive specimens, none of the data indicating any preferential movement as to wind direction. Wind as a means of the dissemination of attractant odors would appear to be of greater consequence than as a factor of physically stimulating or inhibiting fly movement.

To summarize the facts of fly dispersal, it can be said that:

(a) Flies can move rapidly from site to site;

(b) Overall movement of the population is from 1 to 2 miles (**Musca domestica**);

(c) Dispersal from each site is random in pattern;

(d) Specimens congregate in areas or sites having suitable feeding or breeding sites;

(e) Blow flies generally migrate farther and more rapidly than house flies.

Fly Dispersal—Control Link

How can such data be utilized for control purposes? In any control activity, fly annoyance must always relate to the source of the insect production. Unfortunately, the general reaction to knowledge that flies can move to a distance of 1 to 2 miles leads to the conclusion that the cause of any fly problem must be at a distant point. Except for a few instances, this concept is a fallacy. A sudden build-up of house flies in a restaurant should be evaluated first in strict relation to sanitation conditions in that and adjoining blocks. Frequently, the source is nearby refuse, in some instances in the kitchen or immediate environs of the eating establishment itself. If the annoyance is caused by blow flies, the same procedure should be followed, although with these species there is a greater chance that the annoyance may not be in the immediate vicinity.

Where no nearby breeding sites are detected and copious production sites lie 2 to 5 miles distant, one should not ascribe the difficulties to these sources without first considering the condition of the breeding grounds and the nature of the area intervening between it and the problem site. When this intermediate zone contains numerous attractant sites, it, in all probability, is "absorbing" the population dispersing from the breeding location before the flies can reach the problem site in sufficient numbers to be of annoyance. This fact is apparent since the random dispersion of flies from each attractant site results in 50% of a given population at any one site moving in the opposite direction to that taken by the balance of the population. In contrast to this condition, a minimum of attractants in the intermediate zone and a decrease in the availability of breeding media at the production source could easily cause an infiltration of flies into a section of the city 2 to 3 miles distant.

In all tests on fly movement, it has been obvious that traps located at sites generally attractive to flies yielded the greatest number of radioactive specimens. Since attractivity of a site to flies is the key as to whether or not a fly invades and remains at a location, the sanitational procedures followed in an area or at a food-handling establishment will determine whether or not a fly problem will develop therein. The soundness of this tenet was indicated in a study by Waldrop, *et al.* House flies released on both banks of the Rio Grande River between the adjoining cities of Laredo, Texas, and Nuevo Laredo, Mexico, were recovered principally in the latter city which was characterized by a lower level of environmental sanitation.

What is true for fly control at the individual problem site, is, likewise, applicable to community fly abatement. The extent to which a municipality extends its control operations beyond the city boundary must be based on conditions in the outlying zones. In some instances, abatement measures 0.5 to 1.0 mile around

(Continued on page 66)

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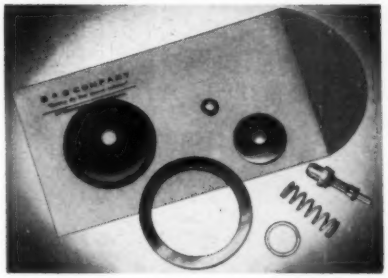

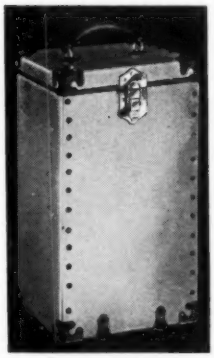

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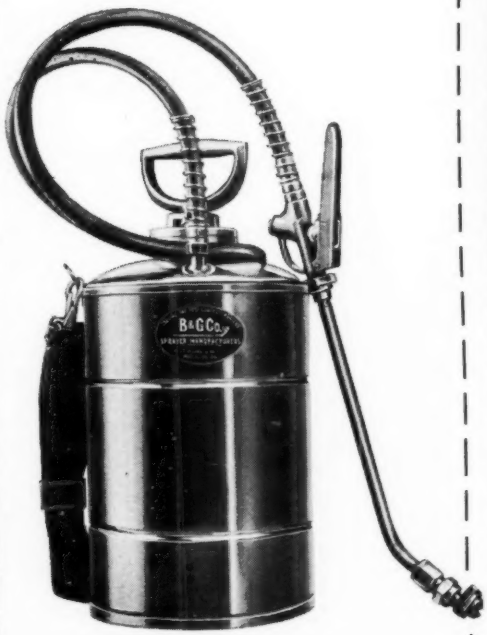

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New Use for An Old Formulation: Spot Suppression of Mosquitoes

by DR. WILLIAM R. HORSFALL

Department of Entomology, University of Illinois
Urbana, Illinois

SPOT SUPPRESSION of pest mosquitoes around lawns, picnic areas, camp sites, etc. is a long-felt need of persons everywhere. There are abatement procedures for large areas and surface repellents for limited areas of exposed skin. For small areas only, housing and screening have provided protection. But test results observed by the author indicate a more feasible, inexpensive means for localized suppression is now available.

Actually, a means for temporary inhibition of mosquitoes has been practiced for a number of years. As early as 1949 I noted that, when released in wooded areas, thermal fogs generated from petroleum solutions caused temporary cessation of activity by pest mosquitoes. Operators of "foggers" in abatement districts are well acquainted with similar temporary results in urban areas. That which has been lacking all of these years has been a suitable carrier for a suppressor that would give a high degree of relief for a day or longer. Fortunately such a carrier has been found that has the added advantage that it may be spread with simple equipment.

Could Leave Out DDT

The formulation used for all of my observations is a dry granular form that has been in use for several years as a "prehatch larvicide" and is prepared by the Riverdale Chemical Co., Chicago Heights, Ill. The carrier is Vermiculite screened to 30-40 mesh. The essential additive is a petroleum fraction between kerosene and fuel oil. DDT is the toxicant that was added as a larvicide. The technique of formulation is a process apparently unique to Riverdale Chemical Co. Presumably the DDT might be omitted from the Riverdale mixture when formulating the suppressor. Observations on this phase are being continued.

When scattered or broadcast over shrubbery and grass at a rate of 10 pounds to an acre, the Riverdale mixture will prevent annoyance from pest mosquitoes (**Aedes** and **Psorophora**) for intervals up to four days during the summer. Biting ceases immediately after application, and suppression is total for the first 24 hours and nearly so for a few days thereafter. The effect is so immediate that the aromatic solvent is suspected of having the suppressing effect.

The Riverdale mixture is effective in areas the size of a lawn, the size of a bivouac area, or of a site for a camping party. The material can be put out by puffer duster, broadcast seeder, or even by hand. The essential aspect of distribution is that the area occupied by persons must be covered as well as that immediately around the perimeter.

Mosquitoes Stop Feeding

The mode of action of the mixture is unknown. Mosquitoes in a treated area cease feeding. In fact, they cease most activity. After the mixture is broadcast, the mosquitoes may be forced to fly by shaking the vegetation to which they cling, but they do not come out of the vegetation voluntarily. Presumably, the action is one of disorientation, but how the material acts on the mosquito is unknown.

The best evidence to date that the mixture has an effect other than repellent was obtained in the latter part of August of 1958. When applied at a rate of 10 pounds per acre over plots of 0.01 acre where oviposition was active, **Aedes vexans** oviposited at the same daily rate on the treated as well as on untreated areas.

In summary it may be said that the Riverdale mixture is a practical solution to the suppression of pest mosquitoes for a few days in one's lawn, in a picnic area or in a camp.

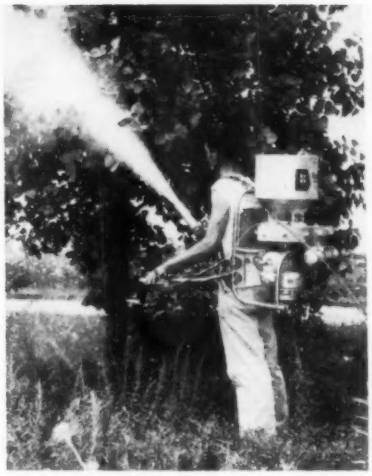
How Granular Mosquito Repellent[1] Performed in the Field

by O. V. LOPP AND W. J. BUCHANAN
South Cook County Mosquito Abatement District
Harvey, Illinois

SINCE 1955, The South Cook County Mosquito Abatement District has been using a granular form of Vermiculite (an expanded mica) containing 10% DDT, for anti-larval work. Soon after a 1956 emergence of **Aedes sp.**, Dr. William R. Horsfall of the University of Illinois observed the virtual absence of adult mosquitoes in a woodland area that had been pre-hatch treated at the rate of 10 pounds of this material to the acre. This was confirmed by the senior author. A nearby, untreated area was observed to contain numerous mosquitoes, although no comparative data were taken at this time. This was reported by one of the writers (OVL) in March 1957, at the 44th Annual Meeting of the New Jersey Mosquito Extermination Association. Again, in 1957, similar results were observed by Dr. Horsfall, his field assistant, Mr. Robert Pausch, and Mr. Lopp in an area heavily overgrown with high weeds and brush and moderately canopied with high vegetation. In this latter instance, approximately ½ acre of the area was hand treated with the granular material described above.

The possibility of using this material to create ground level, temporary mosquito-free areas during periods of emergence for such purposes as public gatherings, picnics, individual premises treatment, etc. was recognized. However, it appeared to us that further information as to period of repellent effect was desirable. Moreover, we felt that in the hands of untrained persons, repeated applications of 10% concentrations of DDT at the indicated rate of 10 pounds to the acre might involve hazards to the personal safety of such inexperienced applicators and could result in undesirable damage to soil insects or other beneficial forms of life.

With these considerations in mind and aware of the relatively low repellent effect of DDT itself and in conference with others, it was decided to observe the effects of applications of the material with and without DDT during the 1958 season. In view of recent news publicity given to use of 10% DDT formulations, it appears timely to report results of our preliminary observations to date.



"Bak-Pak" portable power duster, by H. D. Hudson Manufacturing Co., was used to apply granules to smaller areas in the first test. a hand-crank duster also was used.

First Test Runs 8 Days

An approximately 70-acre plot of semi-wooded area with dense growth of high weeds was selected for the first series of observations. Three 1-acre plots were selected within this area. They were separated by about 2,000 feet to reduce the possibility of drifting of the fine particles. Plot No. 1 was treated with hand equipment, using 10 pounds of the 10% DDT material. Plot No. 2 was treated with 10 pounds of the carrier and solvent, and

1. Vermiculite (Zonolite No. 4) impregnated with approximately 25% (w/w) of an aromatic insecticide solvent as formulated for us by Riverdale Chemical Co.

Table I. Landing Counts Test A

10-Minute Period. Parenthetic Numbers Indicate Percentage Reduction

	PRE-TREAT-MENT	POST-TREATMENT								
		3 HR.	24 HR.	48 HR.	72 HR.	96 HR.	120 HR.	144 HR.	168 HR.	192 HR.
Plot 1 Verm. granules 10% DDT	40	4 (90%)	0 (100%)	1 (97%)	3 (92%)	4 (90%)	8 (80%)	9 (78%)	16 (60%)	31 (23%)
Plot 2 Verm. granules with solvent only	52	1 (98%)	0 (100%)	0 (100%)	0 (100%)	0 (100%)	2 (96%)	6 (89%)	13 (75%)	23 (56%)
Plot 3 Untreated Check	51	49 (4%)	50 (2%)	46 (10%)	31 (39%)	39 (24%)	28 (45%)	46 (10%)	40 (22%)	34 (33%)

Table II. Landing Counts Test B

10-Minute Period. Parenthetic Numbers Indicate Percentage Reduction

	PRE-TREAT-MENT	POST-TREATMENT					
		3 HR.	24 HR.	48 HR.	72 HR.	96 HR.	120 HR.
Plot 1 Verm. granules 10% DDT	93	0 (100%)	0 (100%)	2 (98%)	6 (93%)	9 (90%)	23 (75%)
Plot 2 Verm. granules with solvent only	86	0 (100%)	0 (100%)	2 (97%)	2 (97%)	8 (90%)	18 (79%)
Plot 3 Untreated Check	79	75 (5%)	63 (20%)	61 (23%)	52 (34%)	50 (37%)	46 (29%)

Plot No. 3 was left untreated as a check. Ten-minute pre- and post-treatment landing counts were taken as indicated in Table I on page 25.

It was apparent that by the seventh day (168 hrs.) following treatment, reinvasion was occurring to the extent that the reduction no longer could be considered to constitute dependable nuisance control. It should be mentioned here that during the period of this test two showers of rain occurred, about 0.3 inches on the second night and 0.7 inches on the fifth night. Whether or not this reduced residual repellency of these materials due to covering of granules by splashing of silt and debris is not known. This test was discontinued after the eighth day due to a period of cool and windy weather. During this time, virtually no mosquitoes were active in the entire area.

Turbine Blower in 2nd Test

Another series of observations was conducted by applying the same materials to somewhat larger areas with turbine blowers. Plot No. 1 was an approximately 6-acre picnic site under a heavy canopy of trees surrounded on three sides by dense brush and weed growth. Plot No. 2, about 2 acres, had a thin overhead canopy, surrounded on three sides by dense brush and weed growth. And Plot No. 3, about ½ acre, in size, had mixed dense canopy. Plot No. 1 was treated with the 10% DDT material, No. 2 with the carrier and solvent only, and No. 3 was untreated. Treatments were at the calculated rate of 10 pounds of granular material per acre. Pre- and post-treatment landing rates were observed as in the previously described test. Results are tabulated in Table II at the top of this page.

During this second series of observations one shower of rain occurred, 0.2 inches on the second night.

It was apparent that by the fifth day following treatment the relative effect of treatments was about 45-50% as in the preceding test, indicating that reinvasion was occurring. The cool and windy conditions referred to earlier precluded further observations of this test.

Jeep-Mounted Buffalo Turbine blower was used for granular application over larger areas, in the second phase of the South Cook County field trial.

Conclusions

1. Applications of Vermiculite granules treated with the solvent oil without DDT, gave at least as effective mosquito repellent action as similar material containing DDT.

2. Due to the absence of DDT, it is considered that the granules treated with the solvent alone represent a safer repellent material for general use.

3. The period of significant effective repellent action appears to be between five and eight days after application of either material.

Ill. Survey Marks Centennial

The Illinois Natural History Survey Division has published a 234-page bulletin entitled "A Century of Biological Research," Volume 27, Article 2, commemorating the Survey's 100th anniversary.

Edited by Survey Chief, Dr. Harlow B. Mills, assisted by eight members of his staff, the bulletin traces the progress of the Survey over its first 100 years; contains many photographs illustrating its early-day activities, as well as current programs.

For single copies of the bulletin, write Dr. Harlow B. Mills, Chief, State Natural History Survey Division, Urbana, Ill.

Resistance in Fla. Sand Fly

The salt-marsh sand fly, biting insect pest on Florida's east coast, is showing resistance to several insecticides that once provided excellent control, U. S. Department of Agriculture entomologists report.

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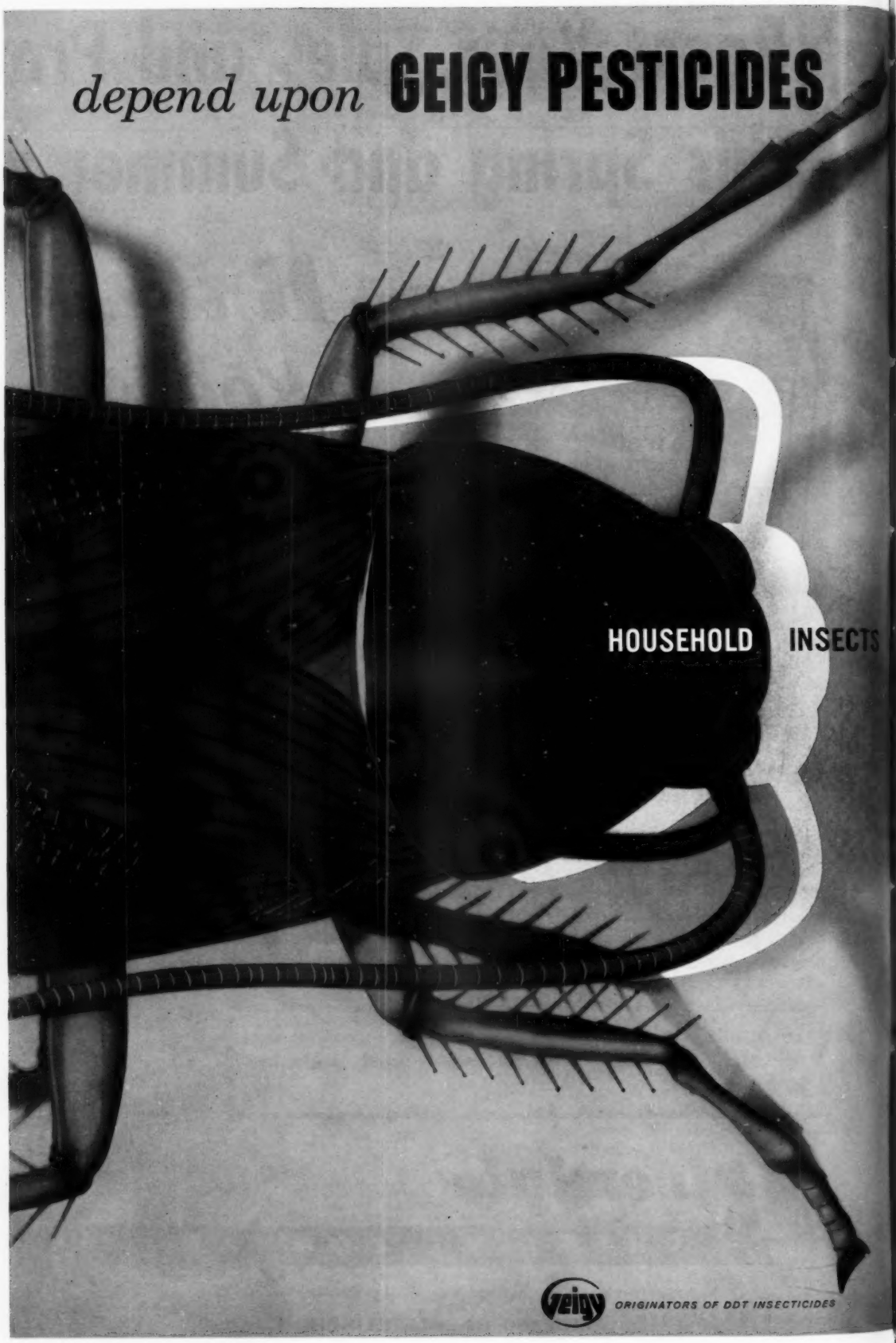
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The Deadly Black Widow.
Photo by Roy Pence.

Venomous Animals, Spiders, and Insects

PART FOUR:

SPIDERS

by SHERMAN MINTON, M.D.

Visiting Professor of Microbiology
Basic Medical Science Institute
Karachi, Pakistan

ALL SPIDERS are venomous, although the great majority of species are too small or too mild tempered to harm man.

The venom apparatus consists of a pair of hollow fangs and venom glands. In all species but tarantulas, points of the fangs come together like ice tongs.

Tarantula

In tarantulas, the fangs move almost parallel to each other. Among a few other details, tarantulas also differ from most other spiders by having two pairs of lungs rather than one. These characteristics define a tarantula for the zoologist, but the general public often uses the name to denote any large spider.

No species of tarantula is known to be very dangerous. Venom glands and fang openings are relatively small, and the venom seems to be of low toxicity. Yet the larger tropical species should be treated with caution. The British Museum is said to have a specimen whose abdomen alone is the size of a tangerine.

Black Widow

For a long time, spider poisoning was almost exclusively associated with tarantulas and other large species. As the tarantula story gradually was disproved, a new villain was found in the black widow and her near relatives. These spiders belong to the Genus **Latrodectus** which has a number of species ranging over nearly all the tropical and temperate regions of the world. They are moderate sized, smooth spiders. Most are black or dark brown with red, orange, or yellow markings on the abdomen and sometimes on the legs. They have relatively large venom glands and fangs and an extremely potent neurotoxic venom. Nearly all species have been known to cause serious poisoning in man.

Some recent work indicates black widows of the U.S., long known as **Latrodectus mactans**, may be a composite of at least two species, one ranging throughout the country and into Canada and one primarily southern. This may explain why black widow bites from some areas seem more serious than from others. In medical literature, hundreds of case reports of **Latrodectus** poisoning indicate a fatality rate of 1 to 3%, mostly in young children and the aged. This rate is probably too high, however, since many mild cases are never treated by physicians.

Wolf Spider

The large wolf spiders **(Lycosa)**, often seen running over lawns or occasionally found in houses, especially during the first chilly days of autumn, can nip painfully if molested. A few cases of fairly serious poisoning have been ascribed to them.

Lynx Spider

An unusual spider injury was observed by E. R. Tinkham while serving with the Army in Florida. A soldier repairing a motorcycle saw a "green bug" that he poked with a screwdriver. He was struck in the eye from a distance of about ten inches by a fine spray of liquid "like hot lead." The "bug" was identified as one of the lynx spiders **(Peucetia viridens)**.

Necrosis Spider

Drs. Atkins, Wingo, and Sodeman have recently incriminated **Loxoceles reclusus**, a small, brownish spider often found in houses, as the cause of a type of spider poisoning fairly common in the Midwest and South. Bites of this spider produce a gangrenous area on the skin and sometimes a rash and other evidence of generalized poisoning.

South American Species

The dangerous character of the South American **L. laeta** has been known to Latin American physicians for some time. Its bite is occasionally fatal.

At least one other potentially dangerous spider is found in South America, the wandering spider **(Phoneutra fera)**. It is a large, solitary species that constructs no web and apparently has no permanent home. It is said to be aggressive, and several hundred cases of its bite are reported annually in the state of Sao Paulo, Brazil. Some deaths have been reported in children under six years old. The bite causes swelling; great pain; and in severe cases weakness and irregularity of the heart, difficulty in breathing, and temporary blindness. In the southern U.S. are several species of wandering spiders belonging to a closely related Genus **(Ctenus)**, so cases of poisoning by these spiders in this country may be possible.

Control

Spiders seem to be less susceptible to the chlorinated hydrocarbon insecticides than most other arthropods, but fairly effective control about dwellings has been reported with the use of benzene hexachloride or dieldrin sprays. Webs of black widows are usually located in dark corners and under rubbish. Spiders and their egg sacs may be crushed or burned. Creosote is recommended as a repellent in privies.

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Next Month: Snakes

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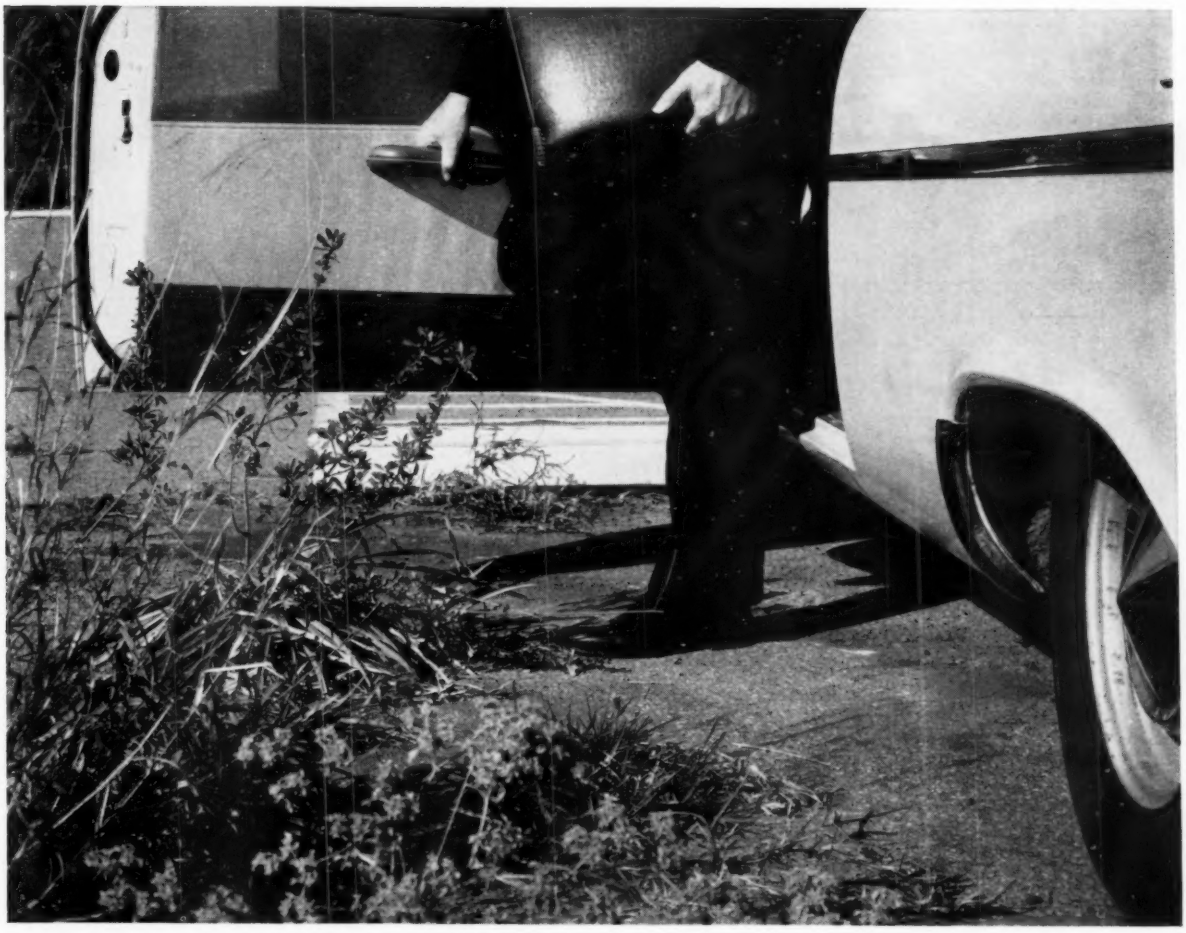

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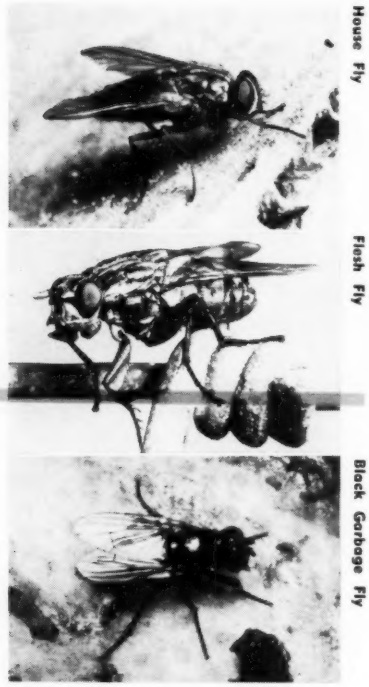
FLY CONTROL—

Is Species Important?

by **DR. ARTHUR C. SMITH**

Technical Fly Consultant

Bureau of Vector Control, California State Department of Public Health, Berkeley



A MYTHICAL Joe Jones of the XYZ Pest Control Company answered an urgent call from the ABC Dairy. Flies were everywhere—milk barn, feeding barn, hay-loft, house, garage, etc. The flies were promptly "knocked down" with an aerosol spray and a good residual spray was applied in accordance with the best current recommendations. The residual spray should have kept the flies under control for many weeks. The dairyman was asked to move and spread in the fields a large manure pile which was assumed to be the source of the flies. He complied that same day.

The very next day, the dairyman was on the phone again. His complaint? "Flies everywhere again. More than before!" The pest control operator returned, sprayed again with an aerosol, and hoped that the residual spray would show better results soon. When the phone rang the third day, Joe Jones suspected the worst. He was right. In spite of the fact that there were dead flies everywhere, the living flies were back again in full force.

This required a new approach. This time the flies were collected and subsequently identified as the lesser house fly, **Fannia canicularis**. This species does not ordinarily breed on dairies (for an unusual exception, see **California Vector Views**, Vol. 5, p. 63, "High Protein Feed Wastes as a Source of Lesser House Fly"), but is found very commonly breeding in chicken manure. About one-quarter of a mile down the road, there was a commercial poultry farm operated by the dairyman's brother-in-law. This family relationship made it easy for the dairyman and the PCO to visit the poultry operation. It was found that the poultry manure on this farm was producing literally millions of **Fannia canicularis**. The poultryman, surprisingly enough, had fewer adult flies on his premises than was the case at the dairy and he privately suspected his brother-in-law of causing his fly nuisance! With better fly control measures (in this case easily arranged by an agreement between brothers-in-law) at the poultry farm, spraying at the dairy became worthwhile. In this case continued spraying at the dairy could have resulted in nothing but unhappiness and dissatisfaction with pest control services. This particular species of fly found many ideal hovering and resting spots in the large buildings of the dairy, but relatively few at the poultry farm. Flies were being produced at the poultry farm in such large numbers that even continued daily spraying could not have brought about control. For each fly killed there were many others to take its place. Until the fly species was identified and the knowledge of its habits and biology put to use, there was no foundation on which to base a reasonable recommendation.

The basic principles involved in choosing a method for bringing about the control of flies are relatively simple and can be applied broadly throughout the field of fly control. They can be briefly summarized as follows:

1. Collect and identify samples of the adult flies which are actually causing the problem (see "Common Flies of Public Health Importance — Identification Key to Adult Forms", page 36).

2. Check on the life history and habits of the fly species involved. Note particularly the preferred larval habitats (see **Pest Control**, April, 1958, p. 31, "The Relationship Between Fly Production and Solid Organic Materials").

3. Locate larval sources.

4. Identify fly larvae.

5. Continue your search for fly larval sources until you find the closest sources producing comparable numbers of flies of the same species as the adult flies causing the problem.

6. Take into account these sources in planning your control program.

In cases where the fly source lies outside the premises you are serving, it may be necessary to obtain the cooperation of others in order to render satisfactory

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FLY BIOLOGY CHART

NAME	LIFE CYCLE DATA				COMPLETE LIFE CYCLE	GENERATIONS PER SEASON (Egg to Adult)	MAXIMUM KNOWN FLIGHT RANGE	HEALTH IMPORTANCE
	Egg	Larva Larval habitat	Pupa	Adult				
MUSCIDAE	20 hours 12-24 hours	5 days (4-7 usual) 3 days - 3 weeks	4-5 days usual 3 days - 3 weeks	15-60 days 106 maximum	8-20 days usual 7-44 days	2-3 per month in warm weather	20 miles	Mechanical germ carrier. Dysentery and diarrheal diseases. Nuisance.
Musca domestica (House fly)	5 - 20 batches of 75-150 placed in cracks and crevices of the breeding medium in bunches	Manure Garbage Fruit waste						
Muscina stabulans (False stable fly) *Muscina assimilis*	140-200 eggs scattered	15-25 days Manure			35-42 days	Several		Potential vector of disease Intestinal myiasis.
Stomoxys calcitrans (Dog fly, stable fly or biting stable fly)	1-3 days Few to 25 in group up to 632 eggs maximum. 122 between blood meals	7-30 days average-15 days hay-manure mix grass clippings	6-20 days Greater frequency 9-13 days	Few days to 72 female Few days to 94 male Average 21-28 days	Min. 14 days Max. 36 " Usual 21 "		Over 50 miles	Severe bites. Myiasis. Rare mechanical disease carrier.
Ophyra aenescens (Black garbage fly) *Ophyra leucostoma*		Manure and garbage						Nuisance locally at times.
ANTHOMYIIDAE	24-48 hours	6-28 days	7-12 days	15-20 days 30 days	Min. 14 days Max. 42 " Usual 15-30 "			Gastric and intestinal myiasis in man. Nuisance.
Fannia canicularis (Lesser house fly) *Fannia scalaris* (Latrine fly)	Deposited in breeding medium	Chicken manure Privies						
CALLIPHORIDAE	8-24 hours 6-48 hours	4-9 days 3-4 days	10-17 days 7- 9 days	About 35 days 16-40 in summer	Min. 14 days Max. 35 " Usual 22 "			Wound myiasis. Intestinal myiasis. Nuisance.
Calliphora vicina (Common blow fly, *Calliphora vomitoria* Large blue bottle fly *Calliphora terrae-novae* or blow fly)	Few to 180 in batch 540-720 during life	Carrion						
Callitroga macellaria (Secondary screw-worm)	4 hours 40-1000 in cemented mass	6-20 days Carrion	7 days	14-42 days	6-39 days	10-14 in Southwest U. S.	15 miles	Wound myiasis. Suspected enteric disease vector.
Phaenicia sericata (Green bottle fly or green blow fly)	8 hours 180 in batch 3000 one fly	3-9½ days Carrion and manure	3-6 days summer	41-56 days	9-21 days		4 miles 10 miles	Intestinal myiasis. Nasal myiasis. Nuisance.
Phormia regina (Black blow fly)	8-52 hours Varying number on carcasses in or near edges of wound	4-76 days Carrion	3-30 days		Min. 9 days Max. 76 " Usual 10-25 "		28 miles	Secondary myiasis. Common sheep maggot.
SARCOPHAGIDAE	Usually deposits larvae	3 days Carrion and animal droppings	8-10 days		14-18 days			Human myiasis, rare intestinal myiasis.
Sarcophaga spp. (Flesh flies)								
DROSOPHILIDAE	20-36 hours	5-57 days	4-14 days	10-120 days	8-12 days	Many	2.4 miles	Nest in privy pits. Intestinal myiasis. Mechanical germ carrier. Nuisance.
Drosophila melanogaster (Pomace fly, fruit fly or vinegar gnat) and other species		Fruit and vegetable waste						
SYRPHIDAE		Liquid or Semi-liquid waste						Rarely gastro-intestinal myiasis.
Tubifera tenax (Drone fly or rat-tailed maggot)								

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service to your customer. In many cases (as in example on pg. 32), it will be possible for your customer to obtain the cooperation of his neighbors. In others, it may be necessary to refer the matter to Public Health or Agricultural authorities, City or County authorities, or an industry sanitation committee. For this reason, it is always good business on your part to maintain friendly and cooperative relationships with other agencies and industries.

Harvey I. Scudder, who developed the Scudder Fly Grill, tells the following story of an investigation he made of a New York State dairy with a heavy infestation of house flies:

"Such an extreme number of flies existed on the premises that there was an obvious cloud of them up to 6 or 8 feet above the ground. The dairy, as far as the physical plant was concerned, was in excellent order and very sanitary. I tried to locate the source of the fly breeding for quite some time without success. The manure was disposed of very promptly; there were never more than a few hundred pounds of manure on the premises, yet the fly population was at extreme level. I found a very minor amount of breeding in calf stalls, some at the base of the silo where the liquor from the silo had soaked into the soil, but at no point could I explain the reason for the very large number of flies. Eventually I came back to consider the over-all layout of the place. The feed barn was about 150 feet from the dairy barn and between the two, the whole area was a nice green lawn. The feed cart was wheeled to the barn over a board walk which covered the intervening 150 feet. As a last resort one day I turned over a section of this board walk and found the answer to the entire problem. Feed had accumulated to a depth of about 4 inches under the walk, and had become moist enough for fly breeding. This feed had several hundred house fly larvae per pound in it, so that for a width of four feet, and a length of 150 feet, enormous fly production was going on. The entire fly problem was cleaned up and controlled by one farm hand in part of a forenoon's work. In contrast, the farmer had been spending a few hundred dollars per year for the control of a

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Common Flies of Public Health Importance - Identification Key to Adult Forms

1 SMALL GNATS: brown to dark brown, attracted to fruit, fruit waste and fermenting vegetable waste.

DROSOPHILA SPP.
The Pomace Fly

2

SHINY FLIES: blue, blue-black, green or bronzy, often with a "metallic" sheen or iridescence, at least on the abdomen.

3

DULL, DARK-COLORED FLIES: gray, grayish-black, brownish or blackish with gray markings. Without a sheen or luster.

4 LARGE BROWN FLIES: like honey bees, fuzzy. Hover about, buzz, come to liquid manure or septic effluent.

TUBIFERA SPP.
The Drone Fly (Adult of Rat-tailed Maggot)

5

Only the abdomen shiny. "Blue-tailed" flies with a dark blue abdomen but with a dull black thorax. Heavy-bodied, usually large.

CALLIPHORA SPP.
The Blue Blow Fly or Blue Bottle Fly

6

Both thorax and abdomen shiny and of same general color.

Thorax with or without darker stripes.

7

Without a long beak and so, not blood-sucking. Only a spongy pad on a short stalk for mouth parts.

With various colors and stripes.

8

With a long forward projecting leg-like beak for blood-sucking.

Fly often rests at an angle with a surface, and with wings well apart.

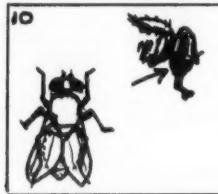
Abdomen gray and brown mottled.

STOMOXYS CALCITRANS
The Biting Stable Fly.

9

Three dark stripes on the thorax, cheeks yellowish below. Bright green flies.

CALLITROGA MACELLARIA
The Secondary Screwworm Fly

10 

Thorax without stripes, cheeks dark below, not yellowish.

Bluish-black, green, bronzy, or black flies.

11

Heavy-bodied flies, not slender, their wings less than twice as long as the length of the fly's abdomen.

12

Slender flies with long wings, the length of wings about twice the length of the fly's abdomen. Fly in hovering zig-zag pattern (usually the males).

FANNIA SPP.
The Lesser House Fly
The Latrine Fly

13

Small, often slender, black flies, very shiny, even on their legs.

Wings may be held flat and one over the other rather than apart.

OPHYRA SPP.
The Black Garbage Fly

14

Heavy-bodied flies often large; green, bronzy, or bluish-black flies.

15

Scutellum (on back between the wing bases) without a lighter color.

Abdomen and thorax with distinct patterns, not all blackish in color.

16 Scutellum (on back between wing bases) pale-colored.

Without distinct pattern, color blackish.

Usually larger, more robust than house fly and wings held wide apart.

MUSCINA SPP.
The False Stable Fly

17

Bright green, yellow-green or bronzy flies with easily-seen bristles on the thorax.

Wings held wide apart.

PHAENICIA SPP.
The Green Blow Fly or Green Bottle Fly

18

Bluish-black flies with bristles on thorax hard to see.

Wings often held flat and one over the other rather than apart.

PHORMIA REGINA
The Black Blow Fly

19

Thorax with 4 dark stripes.

Abdomen with yellowish-brown at sides and below.

MUSCA DOMESTICA
The House Fly

20 Thorax with 3 dark stripes. Abdomen checkered with black and gray.

Often large flies with reddish tip of abdomen.

Lay living larvae, not eggs.

SARCOPHAGA SPP.
The Flesh Fly

Some Flies Commonly Found In and Around Homes

FLY SPECIES	ADULT OCCURRENCE		RESIDENTIAL LARVAL FLY SOURCES				
	INDOOR	OUTDOOR	GARBAGE	ANIMAL MANURES	COMPOST PILES	LAWN CLIPPINGS or STACKED WEEDS	OTHER SOURCES
House fly Musca domestica	Common	Common	All food scraps	Chicken, rabbit, steer & horse	Common	Common	Almost any moist organic material
Lesser house fly Fannia canicularis	Common	Common	Relatively rare	Chicken, pigeon, rarely dog droppings	Less common	Less common	Wild mouse nests
Stable fly Stomoxys calcitrans	Sometimes common	Common	—	Manure mixed with hay or straw	Common	Very common	Beached seaweed
False stable fly Muscina stabulans	Sometimes common	Common	Relatively rare	Many manures	Less common	—	Wide variety
Green bottle fly Phaenicia spp.	Sometimes common	Common	Meat and fish scraps	Dog droppings	Common if meat scraps added	—	High protein content waste
Blue blow fly Calliphora spp.	Sometimes common	Common	Meat and fish scraps	—	—	—	High protein content waste
Blue blow fly Eucalliphora lilaea	Sometimes common	Common	—	—	—	—	Small dead birds & animals
Flesh flies Sarcophaga spp.	Sometimes common	Common	Meat and fish scraps	Dog droppings	—	—	Carrion, dead snails
Cluster fly Pollenia rudis	Sometimes common	Rare	—	—	—	—	Earthworms
Pomace or vinegar fly Drosophila spp.	Common	Common	Fruit & vegetable wastes	—	—	—	Fallen fruit - outside Fruit in bowls - inside
Cheese skipper Piophila casei	Sometimes common	Sometimes common	Bone and meat scraps	—	—	—	Cheese, bones, ham, meat
Moth flies Psychoda spp.	Common	Rare	Rare	—	—	—	Bathroom & kitchen sinktraps, cesspools

problem that once located, was very easily solved."

The PCO who can point out such an easy solution to a serious emergency will no doubt acquire a friend and steady customer even though he may eliminate the need for several (admittedly ineffective) spray jobs.

A few years ago, in a subdivision near a large California city, 60% or more of the homes were visibly defaced by an influx of flies. Large black spots appeared on the outside of the houses, particularly around the window and door frames. Furniture and walls inside were likewise covered with black blotches. All automobiles were also coated with similar fly spots.

The PCO with an expert knowledge of fly habits would immediately know that these large blotches were caused by the biting stable fly **(Stomoxys calcitrans).** This fly is a blood feeder and the digested blood in the droppings is responsible for the dark unsightly blotches.

Stable fly larvae are commonly found in the mixture of alfalfa or other hay and manure that seldom gets thoroughly removed from around corral posts and along the edge of feeding platforms at most dairies. In this case, there was a dairy at the edge of the subdivision and investigation proved it to be a source of stable flies. This seemed to be the cause of the problem. However, sometimes it pays to carry your investigation a little farther. It was also noted that there was a golf course across the street from the dairy. In checking the "Fly Biology Chart", it will be noted that stable flies also breed commonly in stacked lawn clippings. Golf courses frequently build up large piles of lawn clippings if the groundskeeper is not aware of this hazard. In this case, they declared that they always scattered lawn clippings thinly over adjacent fields for rapid drying. However, it was noted that they had recently "weeded" the area and had stacked these weeds eight feet high covering an area of about 20x30 feet. Upon breaking open stems of the coarse weeds, it was found that each stem contained numerous stable fly larvae. This single weed pile was producing more stable flies than the entire dairy across the street! Eliminating this source was quite simple and was done without delay.

Dr. J. W. Tilden, entomology professor of San Jose State College, California, reports an interesting war-time experience. The hospital ship to which he was assigned plied back and forth from various Pacific islands to San Francisco. After several trips, house flies became very abundant aboard ship. They were easily killed but always re-appeared within a few days in spite of the fact that the ship was hundreds of miles from land. It soon became obvious that the flies were being produced aboard ship. Many attempts were made to locate the source of these flies, but without success; the ship was kept spotlessly clean and there seemed little opportunity for flies to propagate aboard ship. Finally, Tilden, a "pest controller" in civilian life, was called in, relieved of other duties, and told to start looking for these fly larvae and stay with it until he found them no matter how long it took. At the end of the second day, he reported back — "mission accomplished." On his tour of investigation, he came back time and again to the area where the garbage cans were washed. The area was immaculate. After the cans were washed, the deck was hosed and scrubbed carefully. But Tilden figured that the most likely organic material on board ship that could produce flies was the garbage. In going over this area with a "fine-tooth comb", he noted that the duck boards on which the cans were placed during washing were encased at the edge of the platform with a metal strip. As a last resort, he had the metal strip removed and discovered the cause of the trouble. Tiny bits of organic material had, over a

long period of time, accumulated in this narrow space between the metal strip and the edge of the duck boards. The space was filled with wriggling larvae of **Musca domestica**, the house fly. This problem was also solved easily once the organic material producing the flies was discovered.

Most readers may concur by now that ability to identify flies and a knowledge of fly biology and habits is highly desirable as a foundation for solving fly problems. Lest there should still be doubters, I will mention one other not uncommon occurrence.

A lady was greatly troubled with what she called "house flies". Indeed, they **were** in and on the house and certainly at a glance looked very much like house flies. Specimens were routinely collected (basic principle number 1, see page 32) for identification. As frequently happens, she could not see the point to collecting flies for identification. "They are flies, aren't they? I don't care what kind they are. I just want to get rid of them." It was explained that it would be difficult, if not impossible, to "get rid of them" permanently without finding out what kind they were and where they came from. As is not uncommon, she "knew" where they came from. "It is all the fault of the next door neighbor who has so many dogs."

However, the fly proved to be the cluster fly **(Pollenia rudis)**. As it happens, this species is parasitic on earthworms and the flies were being produced in her own garden.

From the foregoing, several points would seem to be of importance to the PCO who wishes to give full measure of services to those customers wishing relief from bothersome flies.

1. Rapid spraying for fly control is money down the drain unless efforts are also directed toward eliminating the sources of the flies. With effective source reduction, a regular program of chemical control becomes a worthwhile investment for your customers.

2. In order to promote fly source reduction, the progressive PCO should take an active interest in community fly control programs. Volunteering a free fly and mosquito spray job as an emergency control measure at annual picnics in the city park may pay off handsomely, if not in direct business, in good will public relations and future business. In any case, the PCO would do well to develop a spirit of maximum cooperation with city and county officials and with other industries in his area. Community fly control accomplishments will benefit all PCOs through elimination and reduction of major fly sources, thus making his regular fly control program more effective.

3. Successful fly control must be based on correct identification of the fly species and application of full knowledge of the fly's life history and habits. Maintaining the attitude that a "fly is a fly and that it makes no difference what kind it is because we kill them all anyway" is a sure sign that your fly control methods will fail to give anything but temporary relief. Those customers are not likely to be repeat customers and they are quite likely to discourage others from coming to you.

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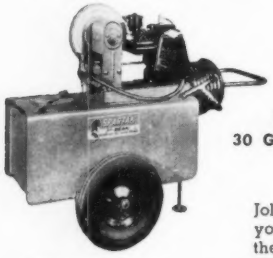

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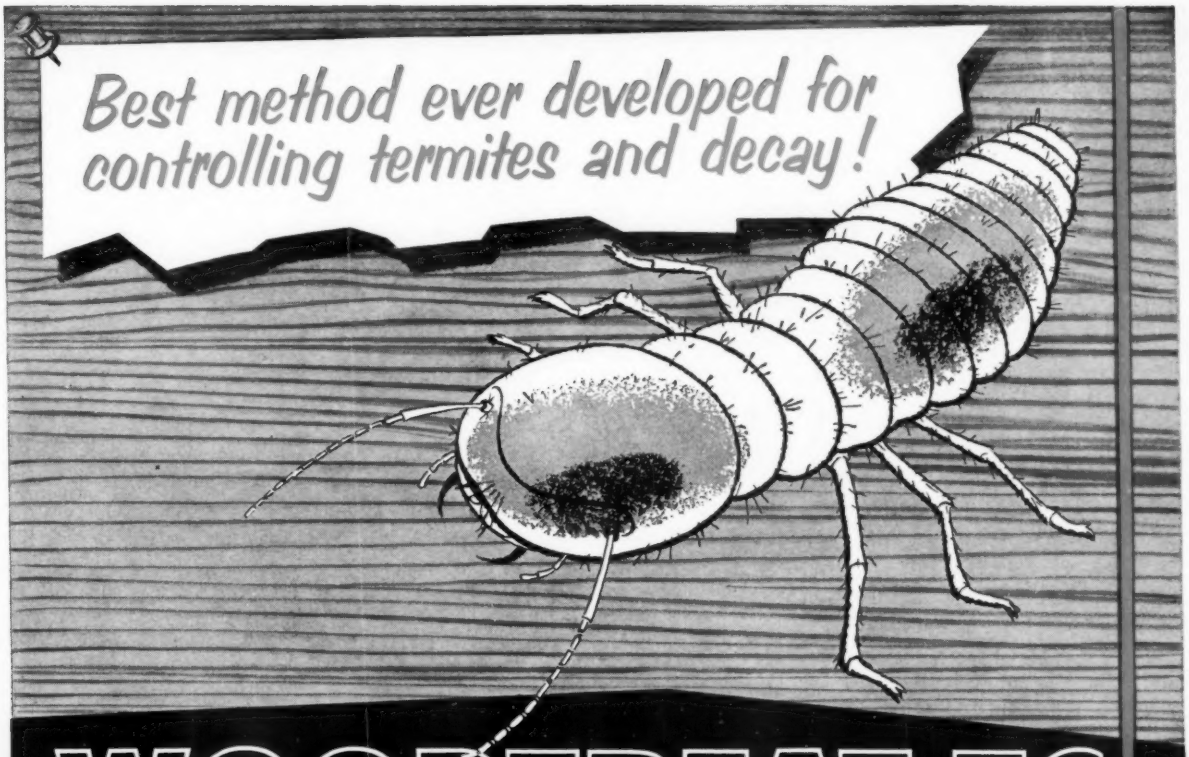

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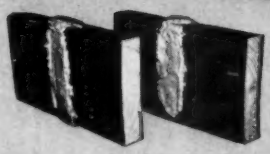

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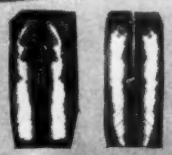

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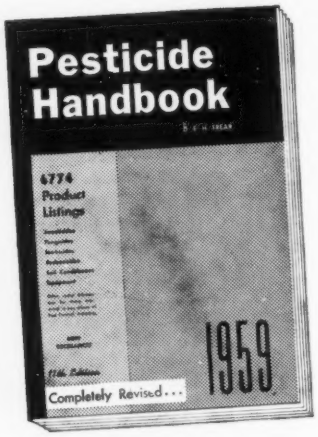

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about the editor—

Dr. Donald E. H. Frear, Editor of PESTICIDE HANDBOOK 1959, is one of the leading authorities on the chemistry of pesticides. He is the author of "Chemistry of Insecticides and Fungicides," the first book dealing with this subject published in the United States. In addition he has written several other books, including "Chemistry of Insecticides, Fungicides, and Herbicides." Dr. Frear is Professor of Agricultural and Biological Chemistry at The Pennsylvania State University.

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1959 officers of the Horticultural Spraymen's Association of Florida are, l-r, treasurer, Harold Hale, Southwest Seed & Garden Center; vice president, William McAllister, Miami Lawns; president, Ted Kaplan, King Spray Service; and secretary, Gus Daye, Superior Nursery & Spray Service. Serving as directors are Hank Petri, Petri's Positive Pest Control; Riley Prince, Riley Prince Exterminators; John Page, Busy Bee Exterminators; Robert Kuster, Florida Spray Service, and Charlie P. Johnson, Charlie P. Johnson Nursery & Spray Service.

Miami Nurserymen and PCOs in Horticultural Business Band to Stop Fly-by-Nights

PCOs who enter the lawn and tree spraying field in the spring may run into trouble from cutrate fly-by-nights who underprice the legitimate operator, do poor work, and thus leave the customer dissatisfied and generally skeptical of all PCOs or nurserymen who offer this service. If you run into such a problem in your area, try this idea that has worked out in Southern Florida.

To help eliminate the fly-by-night, 18 Greater Miami tradesmen, including several pest control operators, last year formed the "Horticultural Spraymen's Association of Florida." The group has kept adding members until today the size of the association has doubled, as has public confidence in its members.

In this time, the association has upgraded general horticultural industry advertising in Miami, and has also enhanced the prestige of ethical operators offering such a service. Among charter members were Truly Nolen, Inc. and Orkin Exterminating Co., Inc., plus other smaller PCOs and nurserymen, garden supply dealers, landscapers, and even a roof coating company. All were faced with virtually the same problem when they first banded together—how to create a more ethical business structure within their field and increase public respect for their business.

Because a considerable amount of pest control work in the Miami area consists of lawn spraying and other related horticultural work, Assistant County Agent, Douglas Knapp, took time out of his crowded schedule to meet with some of the operators and to help them draft a charter and form their association.

One of the main goals of the group, of course, was the elimination of the fly-by-night, the one-bag operator who seldom even has a permanent local address or a listing in the telephone directory. So the association's first step after its organization was the purchase of group-sponsored advertising to inform the public of the association and acquaint homeowners with the emblem of the HSAF. This was to protect the members and the general public against misleading, improper, or false advertising and unethical methods of operation.

During the association's first year, the goal was achieved to a large extent. Now, midway into the second year, HSAF's plans include a continuation of industry policing of its membership, additional advertising to build public confidence, and an attempt to have legislation enacted by the city or county to regulate the use of poisonous sprays. Such legislation would help safeguard the health of the public, as well as that of unqualified sprayers.

The group meets each month to hear speakers representing suppliers, the Florida Agricultural Chemist's Office, Florida Agricultural Extension Service, and other experts on subjects pertaining to pest control.

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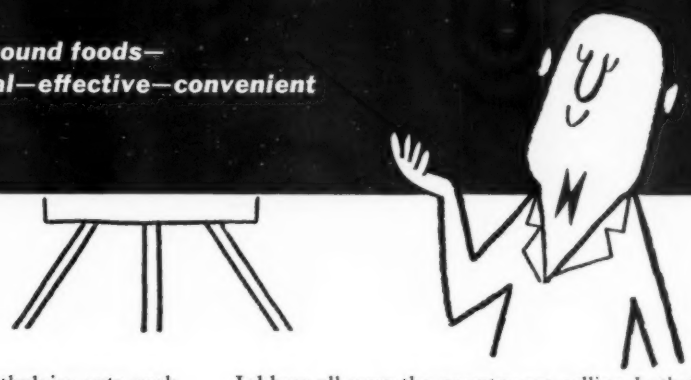

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35 Papers Being Presented at AMCA's 15th Annual Meeting in Salt Lake This Month

Over 300 mosquito control officials are expected for the 15th annual meeting of the American Mosquito Control Association, April 12-15 at Hotel Utah in Salt Lake City. And, delegates will be presented a full program of 21 invitational papers and 14 submitted talks, plus a unique 13-man "operations" clinic and an informal bull session on flight dispersion habits of mosquitoes.

While no formal program is scheduled for the first day, the AMCA's board will meet on Sunday, delegates will start to register, and commercial exhibits will be open.

The official program gets underway Monday morning at 9 a.m. in the hotel's Lafayette Ballroom where all sessions will be held. Here's a day-to-day rundown of this year's AMCA program.

Monday, April 13

Chemicals, Resistance, Flight Dispersion

Dr. John M. Hirst, AMCA president, presides at the opening session which includes welcoming remarks on behalf of the state from Utah Governor, George D. Clyde. Invitational papers cover:

Mosquitoes and Mosquito - Borne Diseases in Indonesia and Their Control—Dr. Don M. Rees, University of Utah, Salt Lake City.

Chemical Research and Mosquito Control—Dr. George W. Pearce, U.S. Public Health Service, Savannah, Ga.

Wind-up of the opening session will be a preliminary business meeting and a noon-hour organ recital at the Mormon Tabernacle.

Dr. A. W. Lindquist, immediate past president of the AMCA, presides at the afternoon session, starting at 2 p. m., that includes these invitational papers:

Status of Mosquito Resistance in the Americas—K. D. Quarterman and Dr. H. F. Schoof, USPHS, Savannah.

Parathion - Resistant Aedes nigromaculus in California — Lawrence Lewallen and Loren M. Nicholson, California State Department of Public Health, Fresno.

Factors Involved in the Development of Resistance to Insecticides and Some Measures to Reduce Its Effects — Dr. W. M. Hoskins, University of California, Berkeley.

Dr. Robert F. Harwood, State College of Washington, Pullman, Wash., will moderate open discussions. Submitted papers next to be presented include:

Residual Sprays for the Control of Anopheles quadrimaculatus Adults in Naturally Infested Buildings — James B. Gahan and Robert A. Hoffman, Agricultural Research Service, USDA, Orlando, Fla.

Improved Methods of Formulating Granular Paris Green Larvicide — Dr. A. J. Rogers and C. B. Rathburn, Jr., Florida State Board of Health, Vero Beach.

Operational Experiences with Pellets in Mosquito Control—Clyde F. Fehn, USPHS, Savannah; and George T. Carmichael, Chatham County Mosquito Control Commission, Savannah.

From 4-5:30 p. m., the Salt Lake City Mosquito Abatement District is to sponsor an equipment demonstration. Then at 7 p. m. in the hotel's Junior Ballroom, Harry H. Stage, past AMCA president, will preside at an informal bull session on flight dispersion habits of mosquitoes. Films are to be shown following the discussion.

Tuesday, April 14

Spotlight on Operations Clinic, Encephalitis

The entire morning session is devoted to an operations clinic in which the audience and a panel of experts are to discuss current operational problems in mosquito control. Lewis E. Fronk, president of the Utah Mosquito Abatement Association, presides at the session; Dr. A. D. Hess, AMCA president-elect and program chairman for the 1959 meeting, will moderate. Participants on the panel include:

C. Donald Grant, San Mateo County Abatement District, Burlingame, Calif.; **V. Samuel Minnich,** East Volusia County Anti Mosquito District, Daytona Beach, Fla.; **A. Paul King,** Ocean County Mosquito Extermination Commission, Toms River, N. J.; **A. S. Glikbarg,** Northern Salinas Valley Mosquito Abatement District, Salinas, Calif.; **A. F. Kirkpatrick,** Agricultural Division, American Cyanamid Co., Fresno, Calif.; **Dr. L. C. Glover,** Agricultural Chemical Sales Div., Shell Chemical Corp., San Francisco; **David Powell,** John Bean Division, FMC, San Jose, Calif.; **Dr. William Dickison,** H. D. Hudson Manufacturing Co., Chicago; **Dr. A. Ralph Barr,** California State Department of Public Health, Fresno; **W. J. Buchanan,** South Cook County Mosquito Abatement District, Harvey, Ill.; **W. P. Warner,** Arthropod Control, Polk County, Bartow, Fla.; **Dr. George W. Pearce,** USPHS, Savannah; and **Dr. William F. Durham,** USPHS, Wenatchee, Wash.

Dr. A. D. Hess, program chairman for this year's Annual Meeting of the American Mosquito Control Assn., has been chief of the Encephalitis Section of the U. S. Public Health Service in Greeley, Colo., since 1958.

In the meeting's Tuesday afternoon session, Daniel M. Jobbins, AMCA vice president, will preside during the presentation of invitational papers, the first of which is:

An Analysis of the Eradication Concept — Harold Farnsworth Gray, Oroville, Calif.

Following Mr. Farnsworth's paper, open discussions will be chaired by Dr. Louis L. Williams, Pan American Sanitary Bureau - World Health Organization, Washington, D. C. Next will be:

Susceptibility of Garter Snakes (Thamnophis spp.) to Western Equine Encephalomyelitis Virus—Dr. Leo A. Thomas, Dr. Carl M. Eklund, and William A. Rush, USPHS, Hamilton, Mont.

The 1958 Encephalitis Outbreak in Northern Utah: Human Aspects — Dr. Rudolph Donath, USPHS, Atlanta, Ga.; and Dr. Alton A. Jenkins, Utah State Department of Health, Salt Lake City. **Infection Rates in Birds, Mammals, and Mosquitoes** — Dr. Leo A. Thomas, USPHS, Hamilton, Mont.; and James V. Smith, USPHS, Greeley, Colo. **Mosquito Populations in Relation to the Outbreak**—Dr. Don M. Rees, University of Utah, Salt Lake City; Louis J. Ogen, USPHS, Greeley, Colo.; Glen C. Collett, Salt Lake City Mosquito Abatement District; and Jay E Graham, S. Salt Lake County Mosquito Abatement District.

Dr. R. E. Bellamy, USPHS, Bakersfield, California, is then scheduled to moderate open discussions. These papers are then to be presented:

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tion in the United States—Dr. Milton E. Tinker and George R. Hayes, Jr., USPHS, Atlanta.

Mosquito Control Problems of the Irrigator — Sterling Davis and Gilbert A. Schumaker, Agricultural Research Service, USDA, Grand Junction, Colo.

Adult Tests Against Aedes taeniorhynchus—Dr. H. F. Schoof, J. Duffy, and C. M. Elmore, USPHS, Savannah.

The final business meeting and election of officers for 1959-60 is planned for 4-5:30 p. m. That evening, delegates and their wives will get together at the Elks Club from 6-7:30 p. m. for a mixer, then move on to the Hotel Utah's Sky Room for their annual banquet and installation of the 1959-60 president. Rolf Peterson will be toastmaster at the banquet.

Wednesday, April 15

"Paired" Papers, Miscellaneous Topics

Richard F. Peters, AMCA past president, will bring the fifth session to order. The morning will be devoted mainly to invitational paired papers. First of these will be:

Mosquito Control from the Wildlife Viewpoint — Paul F. Springer, U. S. Fish & Wildlife Service, Laurel, Md.

Wildlife from the Mosquito Control Viewpoint—Robert L. Vannote, Morris Plains Mosquito Extermination Commission, Morris Plains, N. J.

Following these two will be open discussions, moderated by Dr. Oliver B. Cope. USF&WLS, Denver, Colo. The next paired papers are:

Mosquito Research from an Operator's Viewpoint — A. F. Geib, Kern Mosquito Abatement District, Bakersfield, Calif.

Mosquito Control Operations from a Researcher's Viewpoint—Dr. A. J. Rogers, Florida State Board of Health, Vero Beach.

Dr. W. Donald Murray, Delta Mosquito Abatement District, Visalia, Calif., will then chair a question and answer period. The final two invitational paired papers are:

Toxic Hazards of Mosquitocides from the Public Health Viewpoint—Dr. William F. Durham, USPHS, Wenatchee, Wash.

Toxic Hazards of Mosquitocides from the Mosquito Control Operator's Viewpoint — G. Edwin Washburn, Turlock Mosquito Abatement District, Turlock, Calif.

Dr. W. M. Upholt, USPHS, San Francisco, will moderate open discussions. One submitted paper will conclude the Wednesday morning segment of the meeting:

Expanding Interests of the American Mosquito Control Association — Dr. A. D. Hess, AMCA president-elect, USPHS, Greeley, Colo.

The final discussion that afternoon will be chaired by Dr. Osmond P. Breland, director of the AMCA's Southwest Central Region. Invitational papers scheduled include:

The Mosquito Problem in Hawaii—Patrick Y. Nakagawa, Bureau of Mosquito Control, Territorial Health Department, Honolulu, T. H.

Unmet Vector Problems in Recreational Areas—Richard F. Peters, Bureau of Vector Control, California State Department of Public Health, Berkeley.

Ten submitted papers to be given Wednesday afternoon include:

Problems and Trends in New Jersey Mosquito Control — Daniel M. Jobbins, New Jersey Agricultural Experiment Station, New Brunswick, N. J.

Mosquito Control Activities in the Columbia Basin, Washington, for 1958—Harry G. Davis, State College of Washington, Pullman; and Harry H. Stage, Washington State Depart-

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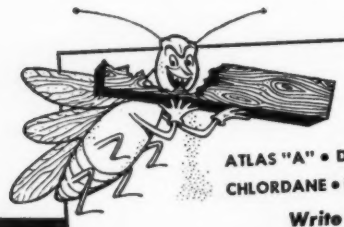

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ment of Health, of Spokane, Wash.

The Mosquitoes of Utah; A Revised List with Notes on Larval Habitats—Lewis T. Nielsen and Dr. Don M. Rees, University of Utah, Salt Lake City.

Radioactive Tagging of Culex quinquefasciatus with P^{32} — Dr. R. W. Fay, J. T. Baker, and J. A. Jensen, USPHS, Savannah.

Artificial Shelters for Adult Mosquitoes — Edmond G. Loomis, California State Department of Public Health, Fresno.

Culex Control on Sludge Lagoons—Franklin C. Wray, Desplaines Valley Mosquito Abatement District, Lyons, Ill.

Increased Efficiency Through Use of Barge to Float Dragline or Clam Shell Crane — V. Samuel Minnich, East Volusia County Anti Mosquito District, Daytona Beach, Fla.

Conversion of Todd Insecticide Fog Applicator from Gasoline to Propane as Fuel—T. W. Miller, Jr., Lee County Mosquito Control District, Fort Myers, Fla.

The Proposed Dam Across the Delaware River to Exclude Tides and the Possible Effects on Mosquito Control — Russell W. Gies, Bucks County Mosquito Control Program, Croydon, Pa.

Relation Between Plant Types and Mosquito Production in the Great Salt Lake Area—Robert A. McHugh, USPHS, Greeley, Colo.

Delegates will next be given an opportunity to sight-see by taking an airplane flight over Great Salt Lake from 4:30-5:30 p. m. That evening at 7 a meeting of the new Board of Directors will be held and AMCA committees appointed for the coming year.

For delegates who stay over April 16, arrangements will be made for special sight-seeing tours and excursions.

Current officers of the AMCA are: president, Dr. John M. Hirst, Preventive Medicine Unit No. 6, San Francisco; president-elect, Dr. A. D. Hess, USPHS, Greeley, Colo.; vice president, Daniel M. Jobbins, New Jersey Agricultural Experiment Station, New Brunswick, N. J.; executive secretary, T. G. Raley, Consolidated Mosquito Abatement District, Selma, Calif.; treasurer, Lester W. Smith, Middlesex County Mosquito Extermination Commission, Metuchen, N. J.; and recording secretary, A. F. Geib, Kern Mosquito Abatement District, Bakersfield, Calif.

For more details on registration, etc., write program chairman, Dr. A. D. Hess, U. S. Public Health Service, Box 625, Greeley, Colo.

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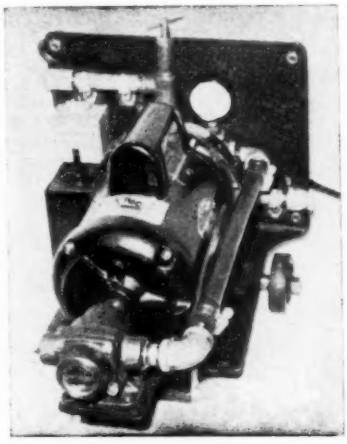

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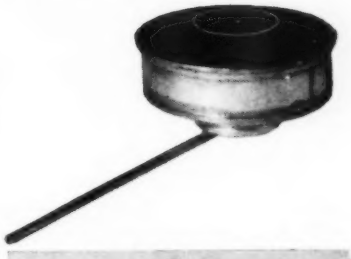

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Orkin "Chlorohepton" Soil Poison Said To Combine Chlordane With Heptachlor

Full page Orkin Exterminating Co. advertisements were appearing in certain areas of the South last month to announce the company's formulation of "Orkil" represented as being "the most effective termiticide available." Ads explain that "Orkil" contains "chlorohepton (patent pending)" that "will not injure shrubbery, is non-staining, non-flammable, and has no disagreeable odor." The company says, "With the formulation of Orkil, an Orkin exclusive, the Orkin Exterminating Company is able to offer an unparalleled surety bonded guarantee against future termite damage."

The National Pest Control Association has advised its members that "chlorohepton" has been registered under the Federal Insecticide, Fungicide and Rodenticide Act, and that the active ingredient statement on the label indicates that the material is based on approximately equal parts of chlordane and heptachlor.

The concept of combining chlordane with heptachlor to take advantage of the long residual properties of chlordane and the quick-kill and fumigant properties of heptachlor was reported to the Association's 1956 Detroit convention by Dr. John V. Osmun of Purdue University, the NPCA says. Dr. Osmun told PC Purdue has had many combinations of chemicals, including one containing chlordane and heptachlor, in the ground since early 1956 to determine their effectiveness against termites.

Results of tests run by the Forest Service of the U. S. Department of Agriculture, reported by H. R. Johnston in PC's February 1958 issue, pg. 9, reveal the individual effectiveness of chlordane and heptachlor.

Johnston reported 1% chlordane has remained 100% effective in ground board tests for nine years, and that 1% heptachlor has been determined 100% effective for five years, the full length of time that it had been included in these same experiments.

According to the NPCA, the Association is not aware of any publication "to date" (3/2/59) of laboratory or practical tests that would indicate a result any greater than an additive effect from the combination of the two chemicals for termite control.

Reliable sources within the industry say it is to be expected that test results will soon be published revealing the relative control properties of several termiticides formulated by combining two or more known-effective termite control soil poisoning chemicals.

Soil Conditions and Termite Control, **PART THREE:**

Classification and Identification of Cohesionless, Cohesive Soils

by J. V. PARCHER and R. E. MEANS
Oklahoma State University, Stillwater, Oklahoma

In Part I of this series (Feb., pg. 29) some properties of soils were described. In Part II (Mar., pg. 57) we related these properties to some particular problems confronting the termite control operator. In this final part it remains only to acquaint the reader with some of the more important procedures used for identifying and classifying soils. It is hoped this series of articles will, finally, enable the individual operator to recognize the nature of his soil treatment problems in a given case and to make an intelligent approach to their solution.

The most important distinction to be made is that between cohesionless soils (sand, gravel, silt) and cohesive soils (clays). Most natural soils are made up of a combination of the preceding components.

Truly cohesionless soils can be readily identified. When moist, they can be handled without sticking to or soiling the hands. Fine grained cohesionless soils (fine sands and silts) can be further identified by a simple shaking test. This test is made by placing a small pat of the moist soil in the palm of one hand and tapping the back of the hand with the palm of the other. If the soil is cohesionless, the surface of the pat will become shiny with free water. Shininess will disappear when the soil is deformed by folding the palm. These phenomena are caused, respectively, by decreasing and increasing volume of the voids. A dried piece of cohesionless soil will crumble apart under the slightest pressure.

Cohesive soils possess plasticity, a property readily recognized, and have a moderate to very high strength when dried.

A few simple observations and tests will serve to indicate those special characteristics of most interest to the termite operator.

Texture Reveals Permeability

By texture is meant composition of soil with respect to percentages of gravel, sand, silt, and clay which the soil contains. This will indicate permeability, the more permeable soils having a very high proportion of the larger grain sizes.

If moist soil has a dark, drab color and a noticeable pungent

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odor, it will undoubtedly contain considerable organic matter (decayed plant life, etc.). Bright and soft hued pastel colored soils, relatively free of odor, are generally inorganic. Fine-grained organic soils are likely to be somewhat more permeable than would be expected from their appearance, particularly if they are permitted to dry thoroughly before treatment with the insecticide.

Moisture Content

The moisture content should be described as dry, moist, or wet. For cohesive soils this can be determined by remolding a small piece of the soil. If it is dry or almost dry, it will crumble during remolding (if it can be remolded at all), and small pieces will not stick together. Moist soil can be rolled into a thread before it breaks apart. Wet soil is quite soft and sticks to the fingers during remolding. Effect of moisture content on treatment procedures was outlined in Part II.

This term is applied only to cohesive soils and may be described by the following adjectives:

Very Soft—Core slumps under own weight
Soft—Easily penetrated several inches by thumb
Medium Stiff—Can be penetrated several inches with moderate effort
Stiff—Readily indented with thumb but penetrated only with great effort
Hard—Indented with difficulty by thumbnail

Other terms considered descriptive of consistency are:

Brittle—Ruptures with little deformation
Friable—Crumbles or pulverizes easily
Elastic—Returns to original length after small deformation
Spongy—Very porous, loose, and elastic
Sticky—Adheres to tools and hands

Care should be exercised in jetting into softer clays. Use of high jetting pressures may wash out a considerable quantity of soil and will disturb or greatly soften clay for some distance around the hole. Brittle clays, particularly, lose a very large proportion of their strength when their structure is disturbed. Friable clays may contain a system of joints (see below). Sponginess generally indicates presence of a large amount of organic matter, which may even be in the form of visible plant fibers. Such soils are often fairly permeable.

Macroscopic Structure

Macroscopic structure means arrangement of larger constituent parts of the soil that can be observed with the naked eye.

Peculiarities of deposition should be noted. For example, stratification in color or grain size is characteristic of sedimentary deposits formed in quiet waters. Irregular lenses of silt in sand, or silt and sand in clay, are often found in stream deposits. Many glacial deposits are composed of a heterogeneous mixture of particles which vary from clay sizes up to boulders. Manner of deposition is thus related to geologic processes which resulted in formation of the deposit. Random presence of objects such as shells, rocks, or junk fill should be noted. It is important to observe whether clay soil appears smooth and homogeneous or whether it contains joints and fissures which tend to make the soil break into pieces in a predetermined manner.

All of the foregoing facts give important clues as to history of the formation and may also have a bearing on procedures to be used in treating the soil. For ex-

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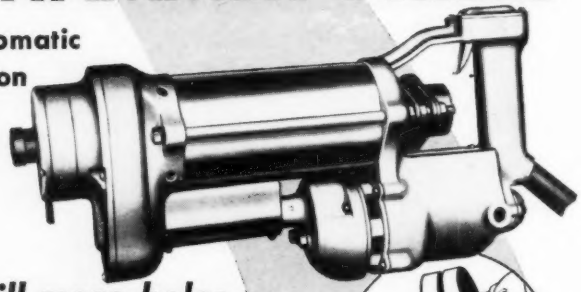

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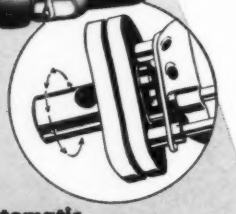

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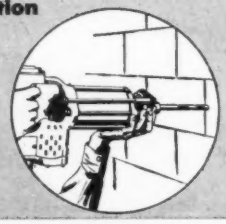

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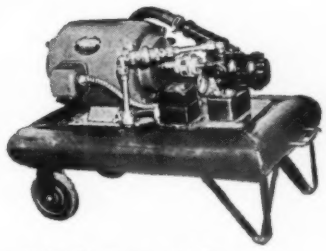

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ample, clays which contain numerous thin layers of sand or silt may be treated by injecting the insecticide from a vertical pipe so it may flow horizontally through the more permeable layers. Due to the low permeability of the clay layers, flow in a vertical direction would be extremely slow. Existence of a joint system is often associated with the drying out of cohesive soils. Most jointed clays are stiff as a result of overconsolidation during drying. These soils may have, though not always, an unexpectedly high permeability due to flow through the joint system.

It has been necessary to omit much specific detail due to limitations of space and time. However, it is believed an understanding of the significance of what has been contained in this series, coupled with the exercise of good judgment and imagination, will often be all that is necessary to enable the individual operator to attack his treatment problems intelligently.

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How to Stimulate Sales Sense in Your Servicemen

by ROBERT E. WEIGAND
Bureau of Business Management, University of Illinois
Urbana, Illinois

It's easy for you to make excuses why your serviceman should not be a salesman. "It's just not done in our industry, (our business is **different**)." "Nobody can do two jobs at one time." "Our fellows are just not the type to sell," or, "They've never been trained to sell." Yet these excuses, used by some managers to distinguish between salesmen and servicemen, are based on pretty flimsy evidence rather than good, solid thinking.

Why Make Servicemen Salesmen?

There are several reasons why your serviceman **should** be a salesman. First of all, he is technically proficient. He knows what your service will do and won't do. Knowledge of a service is one of the points upon which successful selling is built.

Second, the serviceman knows who has used your service successfully. Now obviously you depend to a great extent on testimonials or word-of-mouth advertising in your business. The serviceman is in an extraordinarily good position to take advantage of this good will which accrues to your business.

Third, he is in an ideal physical position to sell. By physical position I mean he is out in the territory all day, every day, meeting all kinds of people in all kinds of positions. They soon learn to trust him and respect his opinion —probably a lot more, in fact, than that of a full-time salesman. This leads to the fourth reason why he should be a salesman. Out in the territory, it is extremely difficult for him to draw the line between servicing and selling. When he is confronted by prospective customers who have a problem, he cannot explain he is in the area strictly to do a service job. He is looked upon by the prospective customer as a representative of your company; and because this serviceman may be the only contact the customer will have with your company, you want the experience to be a pleasing one, as well as profitable. But if the line between servicing and selling is too rigidly drawn, the effect on your customer will certainly not be positive, nor will it even be neutral. It will, in fact, bring about a negative attitude.

There are a number of excuses why servicemen should not be salesmen, of course, but there are many more good reasons why he **should** be. Take advantage of more of your servicemen's talents rather than only part of them.

Now, once your serviceman becomes a salesman, how do you make him sales-minded? Try these six ideas:

"Educate" Serviceman on Sales

First, embark upon a conscientious, well-planned, educational program to show the serviceman both importance of sales-mindedness to the company and what is involved in being sales-minded. Managers of a business always see it's important to keep sales high and costs low, but employees don't always recognize the significance of this sales-to-cost relationship. The importance of selling was brought home to the writer early in life. He worked after school at a restaurant where the owner was really having trouble making income and expenses meet. It concerned me little, I thought, but as you can guess, it soon became my problem too

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when he went broke and I was out of a job.

But just to impress upon workers that sales are important to your business is not enough. Servicemen should be told and then shown how they can help make these sales possible.

Now clearly the content, frequency, and everything about your serviceman meetings are a matter of individual choice. Meetings, as the writer proposes, are a lot of work; but if they are well planned far in advance, they will be worth the effort. Just remember, every organized athletic team on a high school or college campus —football, basketball, track, tennis, baseball, all of them — may train two, three, or four hours a day for a month or more before the season opens. And this is just a game. Yet some operators hire a man, give him a briefing (usually assuming the serviceman knows more about the business than he does), and send him on his way. This is totally unfair to the man; it is the PCO's responsibility to be more equitable to him in terms of preparation for the job he is asked to do. And you can do so by programming educational needs of your people.

Make Serviceman Reach Out

Second, make an effort to establish reasonable goals which constitute a reasonable day's work. Obviously there are times in business when some goals sought are more important than others. Such things as adding dollar volume, making more sales calls, adding new customers, securing prospects, building off-season volume, moving slow items, selling a full line, introducing a new service, reviving dead accounts, and increasing tie-in sales are all legitimate objectives. Perhaps you can better direct your servicemen's effort by setting goals for them rather than by expecting superior performance on a "best effort" basis.

Third, inject a little competitive spirit into your organization by showing you have a system for determining who is the most effective serviceman. Your people may wonder how you decide Joe is a better serviceman than Bill but not quite as good as Willie. If Willie gets $10 a week more than Joe, do they both know why? One PCO in Chicago has a large wall chart that clearly shows which man takes home the biggest pay check and why. This chart indicates sales each man makes, new accounts he has opened, hours spent in the territory, miles driven, skips, and lapsed sales. Ultimately, it attempts to determine which operator makes the greatest contribution to net profit. This Chicago manager would never claim his system is perfect, but he has gone a long way toward compensating his men on the basis of their worth to the company.

Elevate Serviceman Morale

Fourth, if you are to make your people proud of their occupation, you should be aware it is often little things about a job which "professionalize" it in the eyes of servicemen and customers. Among other things to do to upgrade your serviceman's job, keep him well dressed in neat, clean uniforms of good quality. His truck and equipment should be maintained in top operating condition. He should be furnished a sales portfolio which is really an illustrated sales talk; a sales portfolio is essential for preventive selling. Maybe it would even be a good idea to furnish him with

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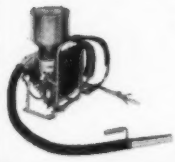

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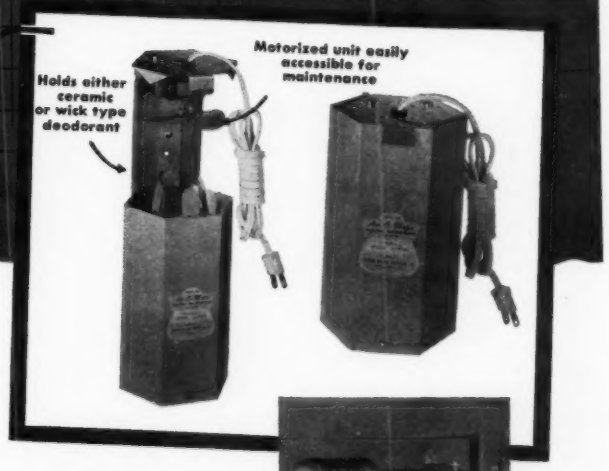

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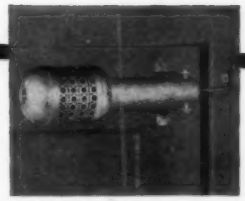

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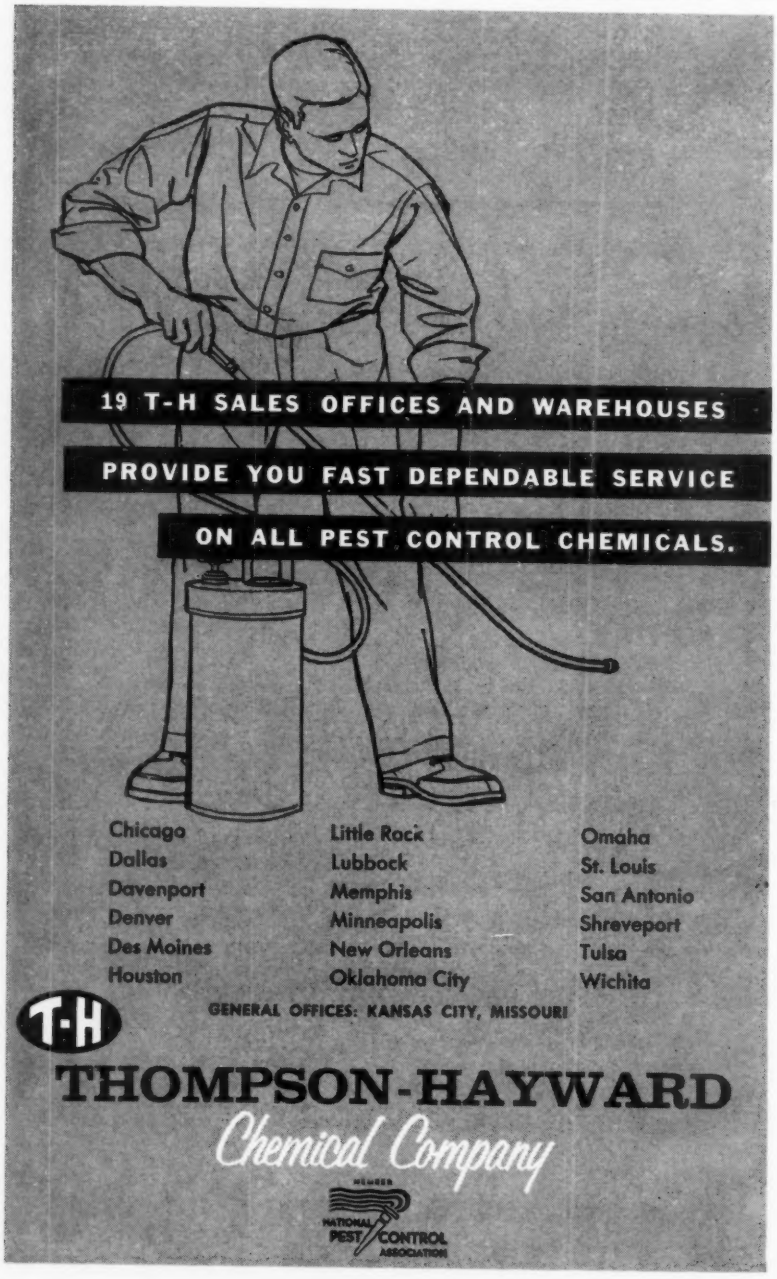
calling cards to leave with the prospective customer. No doubt many can think of additional "extras" from other industries which would be useful in upgrading the social standing of your serviceman's job in his own eyes and in the eyes of others.

Manager's Responsibilities

Fifth, in the daily hub-bub of business, remember you are manager of the business, not just another one of the gang. This is not to make you vain or proud, but to help you distinguish between activities demanded by the two jobs. There isn't time to go into all functions of a manager, but the writer would like to raise a few questions. Are you helping your men plan their day? Are you giving thought to route planning and divisions of territories? Are you helping salesmen by pre-selling the customer? By this, the writer means have you decided on a proper balance between direct mail (calculated to arrive before the salesman) and personal selling? Marketers are more and more attempting to view various promotional activities as part of a complete package; each activity of this package has a significant effect on all other activities. How well then are your activities integrated or coordinated, one to the other, and do you spend time planning toward this integration or coordination? It can't happen accidentally.

Sixth and last, various incentive plans can be used to stimulate your servicemen. Many who use servicemen as salesmen utilize incentives successfully. But others who employ servicemen strictly as technicians might give some thought toward incentives. In the writer's second point, there are many different goals to work toward other than that of net sales. Maybe you should use an incentive plan in your company; you may find results surprising.

Obviously, the nature of your operations and the type of men you work with differ. But various operators use these ideas and have for a long time. They find them quite successful. These ideas are not easy to inaugurate, but they make for real sales sense among your servicemen and greater net profit for you.



Suppliers' Staff Changes

Geigy Agricultural Chemicals, Division of Geigy Chemical Corp., Ardsley, N. Y., has announced two new appointments — one in sales, the other in research. **E. Robert Little** of San Francisco was named Geigy sales representative for Central and Northern California; and **Howard S. Beaudoin** has been appointed to Geigy's field research staff. Beaudoin is assigned to the Pacific Northwest area, will conduct field research on Geigy's new Triazine herbicides and other products now under development.

T. H. Caldwell, Jr. has been appointed manager of the newly-opened Charlotte, N. C. sales office of the Dow Chemical Co. From his office at 504 Wachovia Bank Building in Charlotte, Caldwell will cover North and South Carolina, and portions of Virginia and Tennessee.

Griffin J. Baker has joined the Research and Development Department of McLaughlin Gormley King Co., Minneapolis, Minn. His duties will include the development and promotion of new products currently being investigated.

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The ONE Machine That Will Dry Fog · Wet Fog · Mist or Spray!

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BIRD REPELLENT!

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- Water repellent, temperature resistant, remarkably long lasting.
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MEMBER NATIONAL PEST CONTROL ASSOCIATION

What's NEWS In The Industry

Memphis Student Receives First PC Magazine Scholarship

Paul Michael Estes, 19, a sophomore majoring in Structural Pest Control at Purdue, is the first student to win Pest Control magazine's four-year scholarship. The selection was announced last month by Purdue's Scholarship Committee.

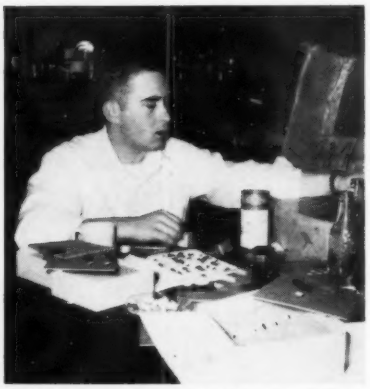
Estes, whose home address is 3610 Powell, Memphis, Tenn., graduated from Treadwell High School after working four summers in the service department of Hill-Smith Systems, Memphis. This early contact with the pest control industry stimulated his interest in urban/industrial pest control, so he decided to study entomology at the one school where a four-year course for pest control operators is given. Since entering Purdue in September 1957, he has helped earn his expenses working as a parttime assistant taking care of the department's insect cultures. The money for his education is coming from funds he has saved, not only working for Hill-Smith, but also from delivering papers and working in a grocery store during grade and junior high school years. Estes' grade average in the current year is above a B.

The announcement was made by Dr. V. C. Freeman, associate dean of Purdue's School of Agriculture. Dr. John V. Osmun, head of the University's Entomology Department, said the selection of Paul Estes for this award is based upon the sophomore's excellent rate of progress during his freshman year and because of his indicated potential.

The basis of this magazine's scholarship grant is the student's financial need, his interest in urban and industrial pest control, and his scholastic standing in high school and/or his first semesters at Purdue.

Preece to Neb. Assn. Helm

During a recent two-day meeting of the Nebraska Association of Pest and Termite Control Operators, George A. Preece, Mid-State Pest Control Co., Lincoln, was elected association president for 1959, and Ralph Kephart, Industrial Termite Control, Omaha, vice president. D. P. Hayes, Orkin Exterminating Co., Lincoln, was voted secretary-treasurer.



Paul Estes—recipient of PC's new scholarship, mounting roach specimens in a Purdue University entomology department lab.

S.C. PCOs Choose Delk

The South Carolina Pest Control Association elected Earl Delk its 1959 president during the second annual Pest Control Operator's School at Clemson College recently. Delk is with Superior Termite Control Co., Charleston.

Voted in with Delk were James E. Grooms, Crown Exterminating Co., Charleston, vice president; and B. S. Westall, Terminix Service, Columbia, secretary-treasurer. Fred Wright, Wright's Pest Control Co., Aiken; Wilbur Holston, Dixie Exterminating Co., Orangeburg; and Ed Yarborough, Carolina Exterminating Co., Spartanburg, are the new directors.

California TO Found "Not Responsible" for Death of Customer Following Soil Treatment

A recent decision by Hon. Clarence Kincaid, Judge of the Superior Court of Los Angeles County, Calif. is reported to have found a termite control operator not responsible for the illness and subsequent death of his customer after the PCO had applied a 2% chlordane formulation to the soil below the crawl space under the customer's house.

It is said the case re-establishes the fundamental principle that a PCO, using relatively non-toxic materials, cannot be forced to assume an affirmative burden of proof merely because of the coincidence of an illness shortly following the application of such a formulation. The case, known as Russell vs. Gordon Termite Control Company, No. 665882, is claimed to be typical of most cases which have been brought against PCOs in that there was no real evidence of a connection between the injury (death in this instance), and the formulation applied.

The plaintiffs were the widower, a World War II amputee, and the adopted son. Testimony brought out that the defendant PCO, following customary trade practices, had applied about 50 gallons of a 2% chlordane formulation to the soil below the crawl space under the Russell home to control subterranean termites. The space was well ventilated to the outside by grills. The evening of the day of application, the Russells all ate a normal dinner. Early the following morning, Mrs. Russell, who is reported to have been a middle-age woman, was found in the backyard violently nauseated. Shortly thereafter she went into a coma and died despite the administration of a heart stimulant and the use of oxygen and a pulmotor.

A coroner's report attributed death to "endema of the lungs" (a condition said to be found in a majority of deaths) "after exposure to chlordane." The autopsy also indicated Mrs. Russell had a rheumatic heart.

Mr. Tony Gordon of the defendant company, Mr. Kenneth Scott representing the Pest Control Operators of California, state authorities and a medical expert supplied by Velsicol Chemical Corporation, together are reported to have been able to establish that the quantity and method of application of the formulation were customary and had been carried on in thousands of instances in the California area alone without ill effects. Their testimony is also said to have shown Mrs. Russell could not have breathed in a sufficient quantity

of vapor to have caused damage; that endema of the lungs was a condition found in almost all deaths except those caused by mechanical accidents, and that Mrs. Russell did not show symptoms which test animals have shown when intentionally given overdoses of chlordane.

The plaintiff's attorneys cited California decisions establishing liability without fault on a defendant who had used an "ultra-hazardous" material, if there was a causal relationship between the "ultra-hazardous" material and injury. Inasmuch as it is known that nausea can be produced by many factors, according to medical experts, this doctrine, if deemed applicable, would have placed an almost impossible burden of proof on the defendant PCO in this instance.

The defense attorney is said to have pointed out to Judge Kincaid that "under the Federal Register Act, 44 USCA 307, he was required to take 'judicial notice' of Revised Interpretation 18, published in the Federal Register by the Department of Agriculture under the Federal Insecticide, Fungicide, and Rodenticide Act, which regulation classifies cyanide and other materials on which the 'ultra-hazardous' doctrine is based, as Class I materials, whereas chlordane formulations are Class III. Judge Kincaid, taking judicial notice, as required, therefore ruled the 'ultra-hazardous' doctrine as inapplicable. He further found there had been no negligence in applying the formulation and that there was no causal relationship between the use of the formulation and Mrs. Russell's death, completely exonerating the Gordon Termite Control Company," according to a report furnished PC by Velsicol Chemical Corporation.

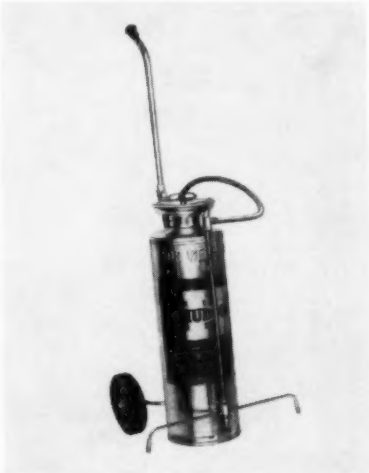
Inasmuch as no appeal was made from this decision, it will not appear in the customary law reports. This publication may serve to acquaint members of the pest control industry with it. The case is said to prove that PCOs and their insurance companies, by making a firm defense, need not pay tribute to compromise claims arising out of pure coincidence in situations where sound trade practices have been followed and relatively non-toxic formulations have been used.

Light-weight vinyl coated nylon tarps for fumigation were field-tested in Jacksonville, Fla. last summer and found effective, according to Hoosier Tarpaulin & Canvas Goods Co., Indianapolis, Ind., tarp designer and manufacturer. After several homes were covered completely with the nylon tarps, methyl bromide was released into the structures at 60-100 pounds pressure. The coverings were removed 24 hours later. No leaking was reportedly detected during the fumigation, and the pest control company which conducted the tests said the houses were made insect free. Fadometer tests also showed no fading of the tarp's bright red color after 500 hours in the Florida sunshine. Other laboratory tests by Hoosier are said to indicate the tarps are waterproof, non-absorbent, and resistant to flame, acid, and rot. With seams double lap felled and sealed airtight and gastight, these tarps have been designed to cover grain elevators, lumber, box cars, crops in the field, and other home, farm, and industrial fumigation work.

Dow Forms British Subsidiary

Formation of a new subsidiary company, Dow Agrochemicals Limited, for the manufacture and sale of agricultural chemicals in Great Britain has been announced jointly by The Dow Chemical Company and Dr. Walter E. Ripper, British agrochemist and managing director of the subsidiary.

The new company, headquartered in London, will function as a manufacturing and marketing facility for one of Dow's weed killers, Dowpon, and eventually for other agricultural chemicals. Dowpon is a selective and systemic grass and weed killer.



For applying weed and crabgrass killers of liquid fertilizers on lawns, is a new sprayer consisting of a 3-gallon tank equipped with a 3-nozzle boom and mounted on a 2-wheel cart. Called the Hudson No. 233 Weed Sprayer, the unit reportedly lays down a 2-foot swath. Its tank is permanently lettered "For Weeds Only" to guard against the sprayer's use for treating plants which may be damaged by any harmful residue or weed- and crabgrass-killers in the sprayer. For further details, write H. D. Hudson Manufacturing Co., 589 E. Illinois St., Chicago 11, Ill.

NPCA Starts PR Program For Member Servicemen

Each month, members of the National Pest Control Association now receive a new NPCA Letter for Servicemen designed to develop the fullest potential of service personnel as public relations representatives.

An attractive poster accompanies the PR idea-of-the-month and copies of the new PR letter are furnished for every serviceman the member wants to receive it.

The NPCA believes that good public relations is vital to the continued success and growth of pest control, both for the industry as a whole and for every company engaged in it. That's why it has initiated this Serviceman PR Program that will run for at least two years.

Magnolia to Bigger Offices

Magnolia Chemical Co. of Texas recently moved into a new general office and manufacturing plant in Dallas' Brook Hollow industrial development. The manufacturing plant has 30,000 square feet of space and the company's underground tank capacity has been increased to 40,000 gallons.

Dwyer Heads Ariz. Assn.

New president of the Structural Pest Control Association of Arizona for 1959-60 is John Dwyer, Orkin Exterminating Co., Inc., Phoenix.

Elected with him at a recent association meeting in Phoenix were vice president, Carl Fletcher, American Anchor Termite Control, Phoenix; secretary, Matthew Van Stelle, Matthew's Pest Control Service, Tucson; and treasurer, C. Heard Field, Industrial Fly Control Service, Phoenix.

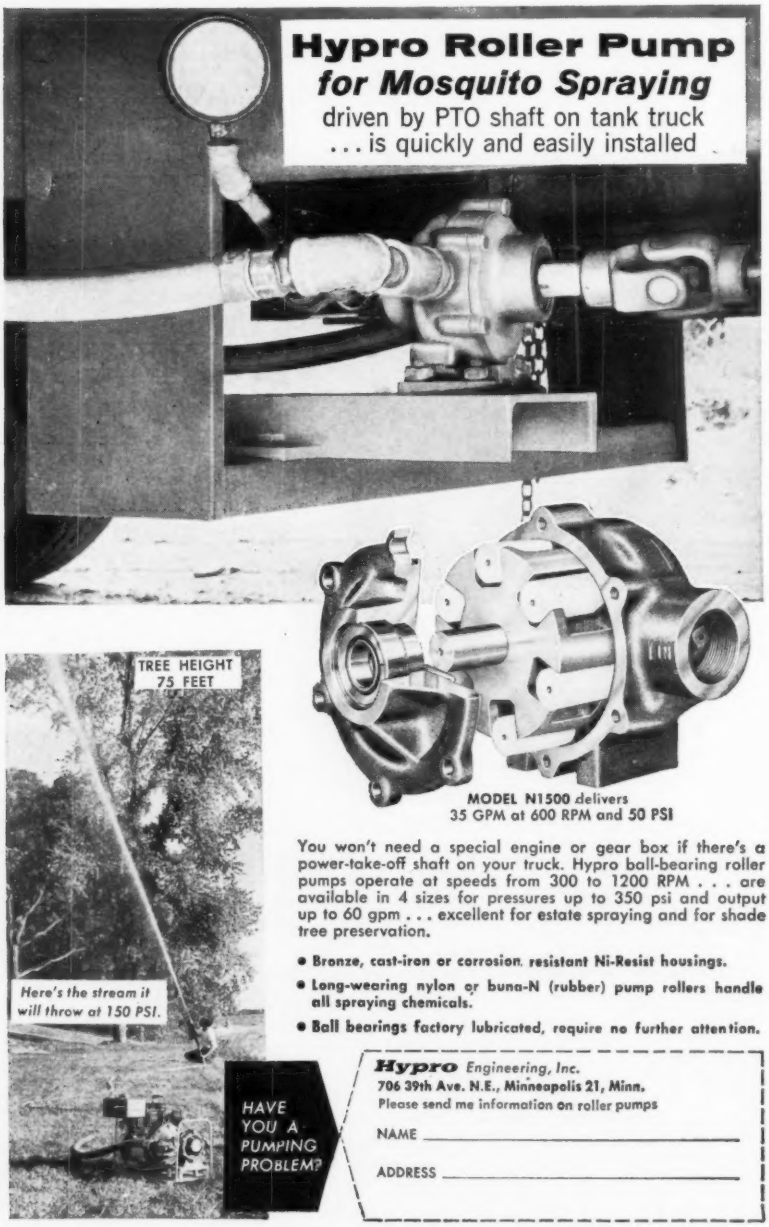
For fiscal 1959-60, association meetings will be held May 16 in Tucson, August 15 in Phoenix, November 14 in Tucson, and February 13, 1960 in Phoenix.

NYPCA Picks Klien

Daniel J. Klien, Allied Exterminating Co., has been elected president of the New York Pest Control Association for 1959.

Other new officers chosen recently include first vice president, Dr. Arthur Brody, Pioneer Exterminating Co.; second vice president, Harry Rosenfeld, World Wide Exterminating Co.; secretary, Stephen Rhodie, Excelsior Exterminating Co.; and treasurer, Harry Gair, Abalon Exterminating Co.

Directors are Robert Bloch, Brooklyn Exterminating Co.; Philip Mayer, Evins Exterminating Co.; Kenneth Tompkins, Tompkins Exterminating Co.; Charles Whalen, Sameth Exterminating Co.; Sidney Wimmer, Majestic Exterminating Co.; and NYPCA executive secretary, Joseph Harris, Guarantee Exterminating Co.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Here's the stream it will throw at 150 PSI.
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Godek Heads Wash. D.C. PCA

New, 1959 president of the Washington (D.C.) Pest Control Association is Theodore D. Godek, Capitol Chemical Co. Elected with him at a recent association dinner meeting were Simon Ratner, Ratner Exterminating Co., vice president; and Samuel G. Durham, J. E. Gaskins Co., secretary-treasurer.

Directors include Martin R. Fain, Owl Disinfectant Co.; Alvin H. Bender, Bender Termite Control Co.; and Louis Kelley, Hygienic Sanitation Co.

Ark. Regulates Strychnine Sales

The Arkansas Legislature recently enacted a bill which forbids the sale of strychnine or its salts except on prescription of a licensed physician, dentist, or veterinarian, or where purchased by a licensed pest control operator.

Any person violating the provisions of the Act will be guilty of a misdemeanor and, upon conviction, can either be fined as much as $200, imprisoned not more than 30 days, or be both fined and imprisoned.

Trunick To Arab Helm

W. H. Trunick, former vice president and general manager of Arab Termite & Pest Control, Inc., Indianapolis, Ind., was recently elected Arab's president, filling the position vacated by H. B. Jordan, who has become chairman of the Board of Directors. Trunick advised PC that Arab plans to construct a new building in Indianapolis to provide additional space for its operation.

Technical Director

We have a very important position for an outstanding man, with entomological and chemical background and a record of successful accomplishment, to head service department of rapidly expanding pest control firm with home offices in Pittsburgh. This is an important position for a man with experience and possessing managerial ability plus. Remuneration to meet full expectations plus opportunity for profit-sharing interest. This is an unusual opportunity for the right man. All replies strictly confidential. Submit account of academic and professional training, past affiliations, earnings, photo and any other pertinent facts to:

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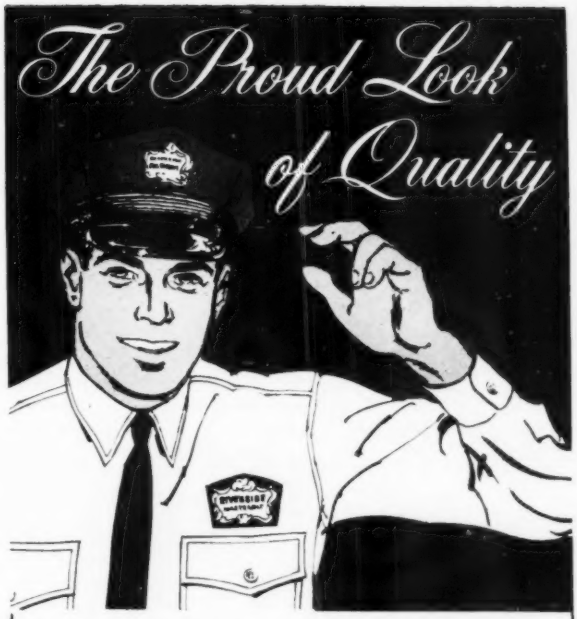

We're happy to say that the proudest names in industry choose RIVERSIDE MASTERBILT, the world's finest business uniform, to distinguish their sales and service personnel. You'll find your sales graph zooming when you put your best foot forward in the uniform that gives you "the proud look of quality." Delivery service is tops; order right away!

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Here's a real *man's* uniform, combining rugged durability with cool summer comfort and good looks! Dacron-Viscose trousers and ski-style cap teamed with crisp cotton poplin shirt. Dress trouser styling with smart front pleats, in a fabric that sheds wrinkles, holds creases, and is home-washable (with light ironing) or may be dry-cleaned. In green, tan, charcoal and royal blue.

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Dri-Die Gets Permanent Label Registration

Dri-Die Insecticide 67, manufactured by Davison Chemical Div., W. R. Grace & Co., has been granted permanent label registration by the U. S. Department of Agriculture for control of roaches, drywood termites, and animal fleas.

Davison says nationwide distribution of the insecticide has already started. Marketing will be through pest control chemical distributors.

According to the manufacturer, Dri-Die 67 is a chemically treated, highly porous silica gel of micron-sized particles, composed of 100% active ingredients. On the internal surfaces of the gel, a small quantity of ammonium fluosilicate, which has known insecticidal qualities, is impregnated in less than a molecular film. The insecticide is said to kill mainly through a desiccant action.

The dust is said to remove a portion of the insect's waxy body surface, and destroy the insect's moisture balance.

Formulators Get Crag Repellent

Fairfield Chemicals Division, FMC, has announced it will make Crag Fly Repellent available to formulators.

Crag Fly Repellent, a Union Carbide Chemicals Co. development, reportedly extends the period of effectiveness of spray formulations used for control of biting flies, horn flies, horse flies, stable flies, house flies, mosquitoes, and gnats on animals. Fairfield plans to make the repellent available to formulators either alone or in combination with Pyrenone, Fairfield's piperonyl butoxide and pyrethrins concentrate.

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AUTOMATIC PERIODIC *Controlled*

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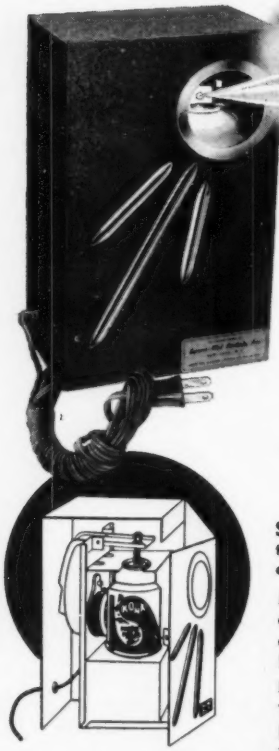

THE NON-TOXIC FLYING INSECT KILLER THAT'S DISPENSED AUTOMATICALLY AND PERIODICALLY WITH METERED PRECISION FOR CONTINUOUS 24 HOUR CONTROL!*

SYNCRO - MIST, KONK, PYRENONE*—the greatest team ever developed for Pest Control Operators! All together create a new, effective and profitable service for you — a MUST for all food service establishments! **SYNCRO-MIST and KONK** is a new concept in flying pest control that embodies continuous and small dose applications — a laboratory and field-tested concept that already has been proven superior to old-fashioned, manual methods!

The **SYNCRO-MIST** Actuator holds a 12 oz. container of **KONK** — the high concentrate killer. Each can of **KONK** is fitted with a specially developed valve, **SYNCRO-MIST-Activated** to dispense for 34 days with clock-like automatic regularity!

SYNCRO-MIST and KONK is a "natural" for 24-hour eating establishments because, for the first time, old-fashioned "fogging" and temporary closings are completely eliminated! **SYNCRO-MIST and KONK** works as customers are served — as they eat! Yes, with **SYNCRO-MIST** — it's business as usual — all the time!

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THIS SIGN OF A THOUGHTFUL FOOD ESTABLISHMENT IDENTIFIES YOUR SERVICE, builds goodwill. Make sure this colorful decal appears on the window of every food establishment you service with SYNCRO-MIST Controls! They're FREE!

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How Far Do Flies Fly?

(Continued from page 22)

the periphery of the municipality will suffice but in all cases the characteristics of these peripheral areas should be assessed as to fly production and attractivity before deciding on the outer limit of operations. With blow flies, particularly *Phormia regina*, control treatments at abattoirs, rendering plants, and similar problem sites 3 to 4 miles beyond the city may be necessary.

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Areas treated with HOPKINS DIELDRIN kill worker termites by contact, thus destroying the colonies by starvation. HOPKINS DIELDRIN formulations give long-lasting residual control. It will not break down in soil where lime or other alkali materials are present. WHERE MOISTURE IS A PROBLEM, USE HOPKINS 5% DIELDRIN GRANULAR. Guard your reputation as a PCO; use HOPKINS DIELDRIN.

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Shut-off needle extends through extension to valve seat placed immediately behind nozzle orifice. When you release the GunJet trigger, spray stops instantly; liquid in extension cannot drip out. No chemical waste. Supplied in 8", 18", 24" and 48" straight extensions. Complete choice of interchangeable orifice tips for flat, hollow cone, full cone and solid stream sprays in wide range of capacities. Note inlet location . . . only nozzle body, extension, cap and orifice tip touch chemicals . . . a design giving a quality, long wearing gun at minimum overall cost.

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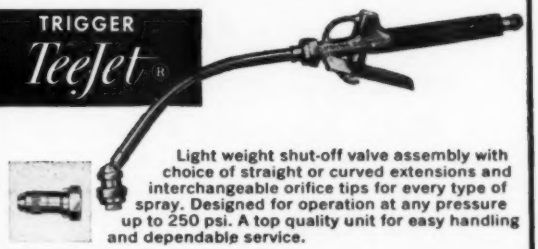
TRIGGER TeeJet®



Light weight shut-off valve assembly with choice of straight or curved extensions and interchangeable orifice tips for every type of spray. Designed for operation at any pressure up to 250 psi. A top quality unit for easy handling and dependable service.

ADJUSTABLE TIPS—MulTeeJet Tip with four indexed positions for choice of flat and solid stream sprays. Adjustable ConeJet Tip for spray selection from solid stream to atomized cone.

Bottle Sprayers

Handy portable sprayers, equipped with quart plastic bottle, pneumatic atomizing nozzle and control valve. For spraying insecticides, sanitation chemicals and related uses.

Write for Bulletins 76, 87 and Data Sheet 7676

SPRAYING SYSTEMS CO.
3221 Randolph Street • Bellwood, Illinois

Primer

Serviceman Training Outline: 4

by Robert E. Berns
Aerosol Exterminators, Chicago, Illinois

LESSONS

- **Jan.:** Introduction, Background
- **Feb.:** Serviceman's Function
- **Mar.:** What Is An Insect?
- ✓ **Apr.:** Insecticides, Rodenticides
- **May:** Rat & Mouse Control
- **Jun.:** Roaches & Their Control
- **Jul.:** Bedbugs & Their Control
- **Aug.:** Silverfish & Their Control
- **Sept.:** Ants & Their Control
- **Oct.:** Don't Be Half Safe!

No matter how well trained you as the PCO are, it's your serviceman who usually molds the customer's opinion of your company. If an employee gives poor service on a call, the customer will likely judge the results with the abilities of your company—not with your service representative. The customer may not bother to request a new serviceman; instead, he might just call in another PCO. That's why you must train new route men conscientiously. Below is the fourth outline of a series of 10 that began in January to guide the planning and presentation of such training classes for serviceman recruits. These outlines cover only the basic phases of pest control, so the PCO may wish to add other more specialized lessons, depending upon the scope of his business. To round out the new man's training, supplement classroom instruction with on-the-job experience.

Insecticides and Rodenticides

Scheduled For: (Date and Place)

References

Toxicology of Newer Agricultural Chemicals. Lehman. Pest Control, January 1949. Trade Magazines, Inc., 1900 Euclid Ave., Cleveland 15, O.

Chemistry and Uses of Insecticides, De Ong. 1956. Reinhold Publishing Co., 430 Park Ave., New York 22, N. Y.

Entoma. 1956-57 edition. E. H. Fisher, Department of Entomology, University of Wisconsin, Madison 6, Wisc.

Materials

1. Bottles and vials of sample insecticides and rodenticides
2. Chalk, blackboard

Object

To classify, discuss insecticides used in structural pest control; consider latest rodenticides

Method

Lecture on newer chemicals with emphasis on practicality in use under all conditions

Presentation

1. Definition of insecticides—chemical substances used to kill insects
2. Grouping of insecticides according to mode of action on insects — stomach, contact, fumigant
3. Grouping of insecticides as to physical property — solutions emulsions, suspensions, dusts
4. Grouping of insecticides according to chemical derivation — inorganics, botanicals, oils, synthetic organics
5. Practical limitations — toxicity, flammability, damage to materials, resistance by insects
6. Definition of rodenticides—chemicals used to kill rodents
7. The toxicity headache—what will kill man and pet animals
8. The importance of choice of baits with rodenticides
9. Rodenticides in general use—Red Squill, ANTU, thallium sulphate, white arsenic, 1080, Warfarin, Pivalyn, Fumarin and liquid anticoagulants
10. Anticoagulants—the choice of the group and its mode of action in warm-blooded animals

Write Today for Your

FREE SAMPLE!

Prove to Yourself at Our Cost that

EATON'S A-C Formula

***Kills* ALL RATS & MICE —**

'cause it tastes so good!

EATON'S A-C Formula is a new, insect and mold resistant anticoagulant formula that features **Fumarin** blended with **19 taste-tempting ingredients.**

You can maintain peak acceptance through alternate usage of the 4 Flavor-Attractants . . .

Test **EATON'S A-C Formula** with **Fumarin** in your choice of any of the **4-Flavor Attractant Baits** (Meat, Fish, Molasses, or Coconut) **Free of Charge.**

Meat — Fish — Molasses— Coconut

Economically Priced at Only 24¾¢lb.*

F.O.B. Cleveland, Ohio in 100 lb. quantities
Packed in 50 lb. containers

*Extra 5% Quantity Rebate Available

We will be happy to send you a FREE SAMPLE

Tell us which of the 4 Flavors you want. Write Today.

EATON'S **RODENT-ICIDES**

effective pest control products since 1932

J. T. Eaton & Co., Inc., 1106 Lakeview Rd. Cleve. 8, O.

You Can **MAKE MORE MONEY**

by using and selling

FUMO-KILL

The New Effective Fumigant That Will Kill

Mosquitoes, Flying Moths, Spiders, Silverfish, Flies, Wasps, and Exposed Waterbugs, Roaches, Bedbugs, and Ants.

FUMO-KILL is truly the modern method of insect extermination. Light match to contents in can, will produce fumes — NO FLAME. Non-hazardous. This amazing FUMO-KILL insecticide has been tested, and found effective against most types of household pests.

FUMO-KILL has the following advantages:

EASY TO USE: Requires no Special Equipment.

ECONOMICAL TO USE: Two ounces fumigates up to 6,000 cubic feet.

EFFECTIVE TO USE — Follow instructions on can for best results. **This Amazing FUMO-KILL insecticide is by all qualifications, a leader in its field.**

FUMO-KILL can be obtained in 2 oz. (enough for up to 6,000 cubic feet)—4 oz. and 1-lb. cans.

Cost of 12—2-oz. Cans . . . . . $ 7.50 per doz.
Cost of 12—4-oz. Cans . . . . . $13.50 per doz.
Bulk . . . . . $ 4.50 per lb.

Delivery Charges Prepaid

For complete information write or phone today.

MAR-MEL PRODUCTS, INC.

Phone: Van Buren 6-2060-61

753 South Kedzie Ave. Chicago 12, Illinois

11. The antidotes for modern pesticides (write list)

Demonstration

1. Actual spraying of residual insecticide in chamber and observation of introduced insects
2. Placement of anticoagulant baits in simulated basement

Examination

1. Simple questions on pesticide classification, modes of action

Calendar

American Mosquito Control Assn. Annual Meeting, Hotel Utah, Salt Lake City, U., April 12-15.

National Sanitary Supply Assn. 36th Annual Convention and Trade Show, Conrad Hilton Hotel, Chicago, Ill., April 12-15.

Indiana Pest Control Assn. April Meeting, Union Building, Butler University, Indianapolis, April 18, 10 a.m.

Washington (D.C.) Pest Control Assn. April Meeting, 4904 Wisconsin Ave., N.W., April 20, 8 p.m.

Oklahoma Pest Control Assn. April Meeting, Room 122, Capitol Building, Oklahoma City, April 21, 7:30 p.m.

New York Pest Control Assn. May Meeting, Hotel Gotham, New York City, May 6, 7:30 p.m.

Structural Pest Control Association of Arizona Meeting, Tucson, May 16.

Chemical Specialties Manufacturers Assn. 45th Mid-Year Meeting, Drake Hotel, Chicago, Ill., May 18-20.

National Assn. of Sanitarians, 23rd Annual Educational Conference, Deauville Hotel, Miami Beach, Fla., June 22-26.

Florida Pest Control Assn. Annual Convention, Clearwater, June 25-27.

North Carolina Pest Control Assn. Mid-Summer Meeting, Morehead-Biltmore Hotel, Morehead City, July 23-25.

Virginia State Pest Control Assn. Summer Meeting, Cavalier Hotel, Virginia Beach, August 21-23.

National Pest Control Assn. 26th Annual Convention and Trade Show, Buena Vista Beach Hotel, Biloxi, Miss., Oct. 18-22.

National Agricultural Chemicals Assn. 26th Annual Meeting, French Lick - Sheraton Hotel, French Lick, Ind., Oct. 21-23.

Sentenced in Sanitation Case

An employee of an Atlanta, Ga. food processing plant was fined $50 recently and the company manager placed on probation for two years after Federal inspectors in the plant discovered flour, rice, and batter mix stored under insanitary conditions and contaminated with rodent and insect filth.

Introduces New Weed Killer

A reportedly new approach to chemical control of woody brush has been offered in a pelleted formulation of fenuron, one of the new substituted-urea herbicides recently introduced by E. I. du-Pont de Nemours & Co. under the name "Dybar" fenuron weed and brush killer.

When the cylindrical pellets are scattered over brush-infested areas — either by hand, with a tablespoon at the base of individual stems or clusters, with a mechanical broadcaster, or by plane —they are said to give positive brush control with one treatment.

Non-volatile, the pellets can be used near sensitive crops, according to the manufacturer. They are also said to be noncorrosive, nonflammable, and to present no toxicity hazard to people or animals when used as directed. Size of the pellets is 1/8". For more details, write E. I. du-Pont de Nemours & Co., Wilmington, Dela.

★ NEW ALDRIN
★ CHLORDANE
★ DIELDRIN
★ PENTACHLOROPHENOL

AFC "Your House of Powders" has always featured the newest developments in control chemicals and a complete quality line of sure-kill, safe, long-lasting, economical insecticides for highly profitable termite, cockroach and mosquito work.

Now . . . AFC is official distributor of Davison Dri-Die® . . . the new, odorless, non-toxic, silica gel powder that kills and controls on all surfaces—economically! Especially recommended for roach, dry wood termite and flea infestations . . . it is effective in doses as low as 8 to 16 ounces per 1000 sq. ft.

P.C.O.'s look to AFC for proven best insecticides—Write today for full details on all of our chemical formulations.

AFC

AMERICAN FLUORIDE CORP.
415 Lexington Avenue
New York 17, New York

Chip-Cal for Crabgrass

"Chip-Cal Granular", a crabgrass preventive for use on established turf, has been introduced by Chipman Chemical Co., Inc., for turf and lawn application.

Chip-Cal Granular is said to be easily applied by a mechanical fertilizer spreader or portable seed-sower, and reportedly prevents crabgrass by killing the germinating seed and seedling plants. Containing a low-lime calcium arsenate, it also suppresses Poa Annua (annual bluegrass) and chickweed and controls certain soil insects and grubs, according to the manufacturer.

Application may be made in the spring, fall, or winter — but before crabgrass seed starts to germinate.

A Chip-Cal Granular sample and a bulletin containing detailed information on the product are available from Chipman Chemical Co., Inc. at Bound Brook, N. J.; or 608 S. Dearborn St., Chicago 5, Ill.

ddvp

DIMETHYL DICHLORO VINYL PHOSPHATE is now being used in sugar-based fly baits and as a phoracide in mushroom culture and for control of cigarette beetle in tobacco warehouses. Because of its high insect toxicity in very low concentrations, and its relatively low toxicity to warm-blooded animals and lack of residue, experimental work is suggested in many fields of application.

ddt

Available in powder, flake and Krisp Chips

Manufactured by

MONTROSE CHEMICAL CO.

104-112 Lister Avenue

Newark 5, New Jersey

FOR SAMPLES AND TECHNICAL DATA ON DDVP AND DDT, WRITE TO:

R.W. GREEFF & CO., INC.

10 ROCKEFELLER PLAZA, NEW YORK, N. Y.

TRIBUNE TOWER, CHICAGO, ILL.

Infestation Report

Contains pertinent portions of the Department of Agriculture's **Cooperative Economic Insect Report**, material from university entomology departments and reports from readers. PCOs noticing infestations in their own areas are urged to communicate with **Pest Control** so their information may be added to this infestation report.

AN ANT
(Cardiocondyla nuda minutior)

California: Collected in state for first time in San Diego, San Diego County.

AN ARGASID TICK
(Ornithodoros kelleyi)

Maryland: Found in a home at Pikesville.

BROWN SPIDER BEETLE
(Ptinus clavipes)

California: Medium in stored barley at Anderson, Shasta County, and in stored grain at Fresno, Fresno County.

A CHINCH BUG
(Blissus sp.)

Florida: Appears to be decreasing in Brevard County. Damage noted on numerous St. Augustine grass lawns in Coconut Grove area of Dade County.

DOG FOLLICLE MITE
(Demodex canis)

North Carolina: Seven cases reported to state veterinarian.

EASTERN SUBTERRANEAN TERMITE
(Reticulitermes flavipes)

North Carolina: Swarmed in a church in Wake County.

MOSQUITOES

Florida: Populations increased in Brevard County. Remained very annoying on lower east coast of Volusia County. Continue at peak population in Indian River area.

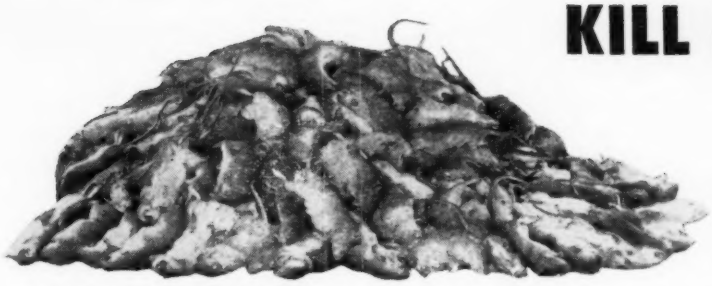
TROPICAL RAT MITE
(Ornithonyssus bacoti)

Oklahoma: Caused dermatitis to some humans in rural areas of Tillman County.

Pail Rack Cuts Spillage

A new "Pour-Easy" Pail Rack, introduced by Multi-Meter Corp., 1041 Custer Dr., Toledo 12, O., is said to eliminate the need for lifting 5-gallon pails and wasting chemicals by spillage when smaller containers are filled from the pails.

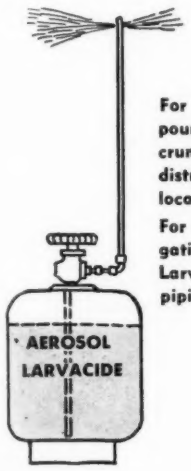
With the "Pour-Easy" Pail Rack, pails are balanced on a frame constructed of 7/8" 20-gauge black enameled steel tubing, and tipped forward to fill other containers. The band which supports the pail on the frame is built of 1"-19 gauge zinc plated steel. Each rack is packed in individual reshipper cartons, 24 to the case.



KILL RATS and MICE OVERNIGHT

. . . without Carcass Nuisance!

EASY TO USE . . . FAST ACTING



For space fumigation, pour Larvacide on crumpled bags and distribute in strategic locations.

For larger area fumigation, use Aerosol Larvasolers or low cost piping system.

Rats and mice which are difficult to control with baits are eliminated overnight with LARVACIDE.

It drives rodents from their hiding places to die on the open floor. *No carcasses remain in inaccessible runways.* And treated burrows usually fall in from dis-use because of residual LARVACIDE.

Where normal fumigation is impractical, a very light concentration of LARVACIDE from wick-bottles will help repel rodents without bothering humans.

LARVACIDE is available in cylinders and in 1 lb. bottles. *Your service man should carry a case of these bottles in his car at all times.* Inquire about inexpensive new piping system for distributing AEROSOL LARVACIDE from outside the building.

Larvacide®

Available in Aerosol 25 - 50 - 100 - 150 - 180 - 250 lb. cylinders and in flat (non-pressurized) 25 and 180 lb. cylinders as well as 1 lb. bottles.

Get Details From —

Panogen® COMPANY — 110 N. Wacker Dr., Chicago, Ill.
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"For More Than 70 Years Choice For Quality"

D D T 4 GAL.
COMPRESSED AIR SPRAYER
Finest compressed air sprayer made. High pressure gauge. 7 ft. hose. For all spraying purposes.

BLIZZARD COPPER
CONTINUOUS SPRAYER
Solid copper tank. Pump barrel is seamless brass. Twin nozzles.

RITESIZE SPRAYER
2 Gal. compact, compressed air sprayer. Dome top welded tank. 5 ft. hose. Light weight. Highly popular. →

SMITH SPRAYERS
are unsurpassed in design and performance.
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TOSSITS KILL MOSQUITO LARVAE

20 Times FASTER

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NO SPECIES IMMUNE

100% Kill in All Breeding Places. Swamps, Canals, Catch Basins, Rain Pools, Ditches

Just toss them into infested water, capsule dissolves in minutes, spreading a lethal film in all directions on the surface. One Tossit larvicides 100 to 750 feet of water.

Clean, Safe, Easy to Handle

50 Tossits larvicide an acre of breeding ground or 50 pools in minutes

Ideal for Hard to Reach Areas

One man with Tossits does the work of five with hand equipment

Write today for prices and literature

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Award-Winning Insect Film May Be Borrowed from Geigy

"Insects Astray," an international award-winning sound motion picture showing how chemistry combats insect damage to apparel and home furnishings may be borrowed from any one of 48 state universities or from the Home Service Bureau, Geigy Dyestuffs Division, Geigy Chemical Corp., P.O. Box 430, Yonkers, N. Y.

Dramatic photography traces the survival of insects over other forms of animal life from prehistoric times; shows closeups of moths and carpet beetles going through their life cycles, depositing eggs, and devouring woolen fabrics, as well as depicting their struggles when confronted with synthetics. Made in Switzerland, the film has a musical background and restrained commentary which explains how man has searched for mothproof fabrics.

The latter part of this movie shows the development of Mitin, a lasting anti-moth compound perfected by Geigy. It is applied to woolen fabrics and wool-synthetic blends during dyeing or other wet processes.

The film was a prize winner at the Swiss Film Festival, and was selected for showing at the Berlin Film Festival and Gold Reel Festival in Chicago.

It comes in two versions, one 13 minutes long, the other 26 minutes, and is suitable for showing on TV and before service clubs, women's clubs, schools, and home shows.

Descriptive literature on the film is available from Geigy on request.

Stauffer Offers Weed Film

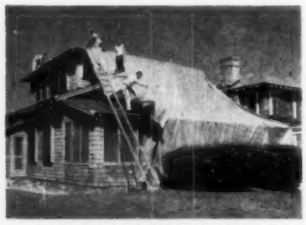
A 16 mm., color, sound motion picture, showing the most efficient methods of applying granular and liquid herbicides for weed control, has been produced by Stauffer Chemical Co., New York. A 12-minute film, it is available from Stauffer offices in New York, Portland, San Francisco, Los Angeles, Houston, Omaha, and Tampa.

Launches 3-Year Bat Study

James B. Cope, director of Moore Museum in Richmond, Ind., has begun a three-year research program to learn mating habits, disposition, and other characteristics of bats in Indiana. He is seeking information from Indiana residents on location of known bat colonies and individual bats in the state.

Hoosier FUMIGATION TARPS

give you *complete* and *positive* control of methyl bromide and all other deadly gases. These vinyl coated nylon Tarps are lightweight for easy handling and are specially designed for fumigation work of all kinds – homes, lumber yards and grain elevators, etc.



Spreading HOOSIER nylon Tarps over house.

Tanks turned on and final check being made.

Available in four basic weights and two colors. HOOSIER Fumigation Tarps are

- Sealed at all seams
- Gastight – Airtight
- Waterproof – Non-absorbent
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Fumigation Division
1302 W. Washington Street • Indianapolis 6, Indiana

Notebook

TIPS AND IDEAS FROM THE FIELD

Residual Rat Ridder

by Maurice Landers
Rose Exterminator Co.
Cleveland, Ohio

If rodents aren't in the burrow when you gas it, you can still be pretty sure of getting a kill when they do return to it.

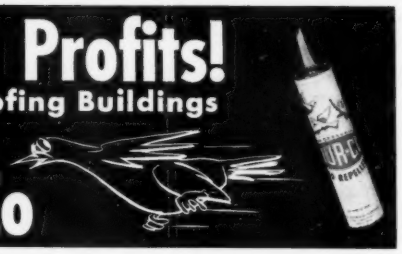
Instead of destroying the tunnel after it is fumigated, pour in some lye and leave it there. Once the absent rats re-enter their burrow and get the lye on their paws, their minutes are numbered. When the chemical begins burning, the rats will instinctively try to lick it off, and thus take it internally. . . . Soon no more rat.

Extra Profits!

Bird Proofing Buildings

WITH

Bur-Co



Low cost . . . easy to apply. A sure-fire extra profit service to offer your customers.

Bur-Co is a chemical bird repellent, guaranteed to keep birds away from ANY building, when used according to instructions. Eliminates unsightly — and damaging — bird droppings. Non-harmful to humans or birds. Does not damage buildings . . . replaces expensive, hard to install mechanical devices.

Comes in convenient cartridges, cans or drums. Easily applied to building with caulking gun or compressor for larger jobs.

Bur-Co

A PROFITABLE ADDITION TO ANY JOB

Write Dep't. C For Details Today!

BUR-CO BIRD REPELLENT

Burr CHEMICAL COMPANY
3329 AUBURN STREET
ROCKFORD, ILLINOIS

MARTINDALE

PROTECTIVE MASKS

ONLY **30c** each

PLACE HEAD-BAND WELL UP AROUND HEAD TO KEEP FROM SLIP-PING DOWN

PRESS NOSE TABS IN CLOSE AGAINST FACE TO HOLD PAD AGAINST THE NOSTRILS

PRESS EDGES OF FACE PLATE DOWN TO FIT FACE SNUGLY

Refills 2c each

so comfortable! so easy to wear!

Amazingly easy to breathe through! Mask weighs less than ½ ounce complete. Adjustable to any head size. Replaceable throw-away filter pads — only clean gauze touches the face. Positively protects against over 400 nuisance dusts. Easily pay for themselves in added comfort, convenience, protection.

Protective Masks ..... **$.30 ea.**
No. 1 Refills (standard wt.) ..... **.02 ea.**
No. 2 Refills (double-thick pad) ..... **.02½ ea.**
Masks packed in individual envelopes. Refills packed 25 to a box. Minimum charge or C.O.D., $2.00. Minimum cash with order, $1.00. Postage paid on all cash orders.

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Put Centrobulbs in your Service Kits!

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A Necessity For Applying Powders to

Kill Resistant Roaches!

Silverfish and other crawling insects and for laying Tracking Powders in Rodent Control

Speedy, Neat, Economical

14 ounce Professional
8 ounce Standard Resale
4 ounce Small Resale

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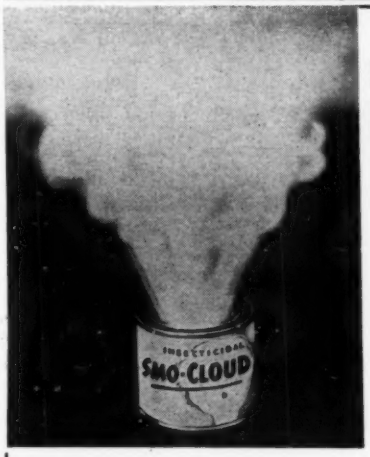

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1 doz. 2 oz. cans
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Penick PCO Dept. Promises Quick, Personal Service

To give more personalized service to PCOs, S. B. Penick & Co., 100 Church St., New York 8, N.Y., has established a special Pest Control Supply Department which permits the company to ship all orders within 24 hours after they are received.

"Where urgency requires," Nick Sanchez, of Penick's Pest Control Supply Department, says, "we will accept collect telephone calls from customers, either in New York or Chicago."

Separate inventories, set-aside for the PCO, are maintained by Penick at both Lyndhurst, N. J. and Chicago.

In addition special preprinted order forms and invoices have been arranged to facilitate handling of orders. Other Penick innovations for the PCO: periodic bulletins on Penick products, and a monthly bulletin on Penick pesticides and other news that might interest the PCO.

Literature to Write For . . .

Here are the latest government, university and association publications of interest to pest control operators. Some can be obtained free of charge, while others are nominally priced. When ordering, include title and catalog number, if any. Sources follow booklet titles.

Evaluation of Ryania for the Protection of Stored Wheat and Shelled Corn from Insect Attack. Marketing Research Report No. 245. 21p. Supt. of Documents, U. S. Govt. Printing Office, Washington 25, D. C. 15c.

First Aid Guide. 1958. 64pp. Catalog No. A 13.36:F 51/5/958. Supt. of Documents, Government Printing Office, Washington 25, D.C. 25c.

Fleas, How to Control Them. Rev. 1958. 8p. Catalog No. A 1.35:392/2. Supt. of Documents, Gov't. Printing Office, Washington 25, D. C. 10c.

Fly Control Recommendations. 1958. 2-fold. Leaflet 234. Bulletin Clerk, New Jersey Agricultural Experiment Station, New Brunswick, N. J.

Insect Control for Motels, Resorts, and Cottages. Circular R 203. 20p. Agricultural Experiment Station, Cooperative Extension Service, Michigan State University, East Lansing, Mich.

Insect Control Guide—Nursery and Ornamental Plants. 1958. 8p. Leaflet 233. Bulletin Clerk, New Jersey Agricultural Experiment Station, New Brunswick, N. J.

Johnson Grass as a Weed. Rev. 1957. 14p. Supt. of Documents, Gov't. Printing Office, Washington 25, D. C. 10c

Moisture - Barrier Performance of Ground Covers in Basementless Homes. Forest Research Note No. 85. Northeastern Forest Experiment Station, Upper Darby, Pa.

Observations on the Biology of the Imported Fire Ant. 1958. 21p. ARS 33-49. Supt. of Documents, Govt. Printing Office, Washington 25, D. C. 15c.

Pesticides — 1957 Economic Poisons. Inspection Series 71. 32p. Bulletin Clerk, New Jersey Agricultural Experiment Station, New Brunswick, N. J.

Prevention and Control of the Western Subterranean Termite. 1958. 16p. Circular 469. Agricultural Publications Office, 22 Giannini Hall, University of California, Berkeley 4, California.

Soil Treatment, An Aid in Termite Control. Rev. 1958. 7pp. Catalog No. A 1.35:324/2. Supt. of Documents, Government Printing Office, Washington 25, D. C. 5c.

Stored Grain Pests. Rev. 1958. 46 p. Farmers' Bulletin No. 1260. Superintendent of Documents, U. S. Government Printing Office, Washington 25, D.C. 25c

Suggestions for Fly Control in Poultry Establishments. ARS-33-45. Rev. August 1958. 7p. Agricultural Research Service, U. S. Department of Agriculture, Beltsville, Md.

The Status of Insecticide Resistance in Arthropods of Public Health Importance in 1956. Reprint No. 223. 11p. Technical Development Laboratories, Communicable Disease Center, P.O. Box 769, Savannah, Ga.

Treatments for the Protection of Stored Southern-Grown Corn from Rice Weevil Attack — Exploratory Tests. 1958. Marketing Research Report No. 272. Office of Information, U. S. Department of Agriculture, Washington 25, D. C.

Two New Glyptotermes from the Philippines (Isoptera Kalotermitidae). 3pp. Dr. Thomas E. Snyder, Research Associate, Room 387, Division of Insects, Smithsonian Institution, Washington 25, D. C.

Wasps, How To Control Them. Rev. 1958. 8 p. Catalog No. A 1.35:365/2. Supt. of Documents, Gov't. Printing Office, Washington 25, D. C. 5c.

Book Review

Insects and Mites of Western North America

by E. O. Essig. The MacMillan Co., 60 Fifth Avenue, New York 11, N. Y. 1958. 1,050 pp. $18.

In this up-dated edition of his 1926 book, "Insects of Western North America," Professor Emeritus E. O. Essig of the University of California's Department of Entomology has classified insects found in the western area bounded on the north by the northern limits of Alaska, on the east by the Rocky Mountains, on the south by Mexico and Southern California, and on the west by the Pacific Ocean.

Included in the area are New Mexico, Colorado, Wyoming, Montana, Idaho, Utah, Arizona, Nevada, California, Oregon, Washington, Alaska, and British Columbia.

Containing 766 illustrations, the text covers 25 insect orders, describes thousands of species and where they are found. In addition to the subject index is a handy index of host plants.

Army Out of Roach Business

Uncle Sam's cockroach colony in Natick, Mass.—the largest living collection in the world, containing 100,000 specimens — is scheduled to go to some college entomology department July 1. Reports indicate the college will be Harvard and/or Cornell.

The Army's research division began amassing the colony over seven years ago for the Quartermaster Research & Engineering Command to learn as much as it could about insect behavior, what attracts insects, and how to control them. The long-range goal was to be added protection of the Quartermaster food supply.

Booklet on Ag Chemicals

The National Agricultural Chemicals Association has published a 64-page, illustrated booklet covering the role agricultural chemicals play in protecting food. property, and health.

Entitled "Open Door to Plenty," the booklet reviews, among other topics, fundamental principles of pest control, new lines of chemical research, experimental criteria for testing agricultural pesticides, and various application methods. Single copies can be obtained without charge by writing the NSSA, 1145 19th St., N. W., Washington 6.

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Classifieds

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Rates: "Position Wanted" 5c per word, minimum $2.00. All other classifications, 10c per word, minimum $2.00. All classified ads must be received by Publisher the 10th of the month preceding publication date and be accompanied by cash or money order covering full payment.

HELP WANTED

FLORIDA CERTIFIED pest control operator wanted. Good salary, commission, and transportation. All replies confidential. Vaccinol Termite Control, Inc., 4227 Bay-to-Bay Blvd., Tampa, Fla.

TECHNICAL PERSONNEL wanted by large service-minded company. Duties to assist branch offices in pest and termite control services. Some travel and no sales required. Degree helpful but not essential. Benefits include life insurance, hospitalization, pension, paid vacation, and sick leave. Ample opportunity for advancement. Send resume including salary history. All replies confidential. Interviews in Atlanta by invitation at our expense. Write in detail to Orkin Exterminating Co., Inc., 713 W. Peachtree St., Atlanta, Ga. Attention: Technical Dept.

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TECHNICAL DIRECTOR—We have a very important position for an outstanding man, with entomological and chemical background and a record of successful accomplishment, to head service department of rapidly expanding pest control firm with home offices in Pittsburgh. This is an important position for a man with experience and possessing managerial ability plus. Remuneration to meet full expectations plus opportunity for profit-sharing interest. This is an unusual opportunity for the right man. All replies strictly confidential. Submit account of academic and professional training, past affiliations, earnings, photo and any other pertinent facts to: L. L. Crosby, President, Commonwealth Sanitation Co., 3567 Bigelow Blvd., Pittsburgh 13, Pa.

FLORIDA CERTIFIED pest control operator wanted for unusual opportunity in responsible position. All replies confidential. Interviews in Tampa at our expense. Terminix Company, 3432 South Dale Mabry, Tampa, Fla.

WANTED: MANAGERS for branch offices. Rapidly expanding pest control firm requires high-type men to manage offices. Must have initiative, sales ability, and forcefulness. Prefer graduate entomologists with practical experience. Will also consider applications from men now in the pest control field, who possess good education, sound technical, and business background. Excellent opportunity to become associated with progressive organization enjoying solid financial position. Salary and percentage. Submit complete data: age, education, experience, and other pertinent details, together with photo. All replies strictly confidential. L. L. Crosby, President, Commonwealth Sanitation Co., 3567 Bigelow Blvd., Pittsburgh 13, Pa.

WANT TO BUY

WILL BUY pest control business in Pennsylvania, Ohio, Kentucky, Maryland, District of Columbia, Virginia, North Carolina, South Carolina, and West Virginia. Write details to R. D. Erdie, 410 Ogden Ave., Fairmont, W. Va.

INTERESTED in buying exterminating business in Chicago or Kansas City. Replies confidential. Box 486, Pest Control magazine.

WILL PAY TOP PRICE for exterminating business in New York City area. Cash. Replies confidential. Box 439, Pest Control magazine.

WELL - ESTABLISHED Southeast Missouri firm desires connections with good reputable firm for purposes of expansion. Confidential. Box 498, Pest Control magazine.

FOR SALE

DYNA-FOG Insecticidal Fog Generator Model DFG. Used one season. Perfect condition. 15-gallon tank. Extra valve head, complete. Cost $1,165. Sell for $500. Industrial Chemical Co., 830 Ellis Ave., Ottumwa, Ia.

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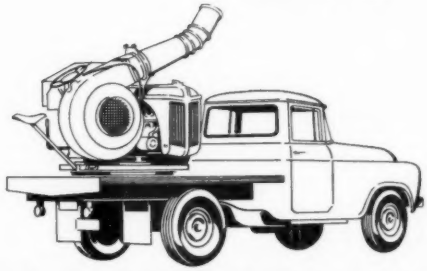

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Pestales

McNeil retires to motel-ing. Aubrey McNeil, McNeil Pest Control Service, West Chester, Pa., is giving up the pest control business and retiring to New Hampshire to try his hand with a motel. Aubrey, treasurer of the Eastern Division of the Pennsylvania Pest Control Association for the last 11 years, has been the longest, continuous office holder in the association's history.

* * *

Swap mouse for a spouse. In Jakarta, Indonesia, a couple has to come up with 25 mouse tails before they can get a marriage license, while applicants for identity cards need five. It's a new law to help stamp out a mouse problem in Jakarta's rice fields. *Fortunately for the mouse, inflation is not one of Jakarta's problems.*

* * *

Studies more than textbooks. Richard Redd, son of J. C. Redd of Redd Pest Control, Jackson, Miss., has been learning the pest control business from every angle. Not only is sophomore Dick Redd majoring in entomology and business at Mississippi State University, but he's paying his own way by servicing the campus dormitories, veterans' apartments, and academic buildings. He picked up the contract in 1957. During summer months, J. C. keeps Dick busy at the home office in Jackson. Dick says he started hanging around the office when J. C. first went into the business in 1946; and in 1955 went to work with a brush crew killing weeds. He plans to work on his master's degree in entomology at Mississippi State after graduation, then study for his doctorate.

* * *

A different kind of insurance. An 11-year old Milwaukee girl asked Henry Turrie if his Wil-Kil outfit was an insurance company. Seems the question came up when she saw Henry's billboard "For Your Protection — Wil-Kil." And a natural question it was, too, since her papa is an insurance man.

* * *

Stones lawn pests to death. If there's any doubt in your mind about the interest of home owners in lawn care, take a cue from this story out of Miami. J. Thomas McDaniel made up his mind in 1950 he'd have the sharpest lawn in Dade County, so he installed an elaborate sprinkling system, brought in 60 loads of top soil, and planted a quality grade of grass. But chinch bugs did him in the very first season. Undaunted, McDaniel dug up what was left of his grass and put in another type which chinch bugs don't go for. They didn't either, but web worms did. So McDaniel summoned a PCO and had his lawn fumigated under nylon tarps. The web worms stopped munching, but just long enough for the gas to dissipate, then they returned. Again McDaniel dug up all the old grass; again he switched to still another variety. And the web worms switched right along with him. It wasn't until last month that McDaniel finally gave up. With nine years and $5,000 down the drain, he hired a truck, hauled in six loads of boulders, and converted his yard into the prettiest rock garden in the county.

* * *

Thallium tracking powder. Elmer Jones of Jones Pest Control, Inc., Owensboro, Ky., was getting an hourly plug on Owensboro radio stations a few weeks ago, but it wasn't his pest control service that was being promoted. Two men had burglarized his office after he left the night before, and in the process knocked over a bucket of 99% pure concentrate thallium sulphate, getting it on their hands and shoes. Jones said he found handprints and foot tracks "all over the place." Because the powder can be absorbed through the skin and cause death in two to five days, Jones alerted the radio stations and an appeal went out each hour for the two men to give themselves up and seek treatment. The break-in, incidentally, netted the pair $11.04.

* * *

There will be days. Last month a harried suburbanite burst into a Chicago PCO's office. "Gimme something to get rid of bugs. We got 'em all over our apartment," he blurted. "What kind of 'bugs'?" inquired the PCO. "Uh, bugs just like that," the customer responded, pointing to a large German roach strutting across a shelf containing the operator's retail chemical supply.

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